DETERMINANTS OF SPOUSE/PARTNER INFORMAL CAREGIVING AND ITS IMPACTS ON INFORMAL CAREGIVERS' PHYSICAL, PSYCHOLOGICAL HEALTH AND ECONOMIC WELL-BEING: EVIDENCE FROM THE HEALTH AND RETIREMENT STUDY

BY

MING SHENG WANG

DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Social Work
in the Graduate College of the
University of Illinois at Urbana-Champaign, 2014

Urbana, Illinois

Doctoral Committee:

Associate Professor Chi-Fang Wu, Chair
Associate Professor Min Zhan
Associate Professor Susan Cole
Lecturer Susan Farner

ABSTRACT

State policies have recently trended towards encouraging home and community-based services (HCBS) over institutionalized care because of the relative higher costs and lower quality in institutions. Studies suggest, however, that this cost-saving strategy has hidden individual and societal costs that may only surface when the informal caregivers grow older themselves. For example, intense caregiving can negatively impact the caregivers' long-term physical, mental/psychological, and economic well-being. However, the determinants of caregiving duration and their impacts on caregivers' later physical health and psychological health and economic well-being have never been examined holistically. Prior studies touching on these issues have narrowly emphasized the influence of either the elderly recipients' or caregivers' characteristics on informal caregiving and caregivers' outcomes.

To address these limitations, this study examined the following questions: Q1) What are the determinants of informal caregivers' time spent on caregiving? Q2) How do caregiving hours impact informal caregivers' later physical health, psychological health, and economic well-being? Furthermore, this study examined the associations between predisposing, enabling, and need factors from the viewpoints of both care recipients and caregivers. It also examines differing lengths of caregiver commitments and how they impact the caregivers' outcomes (physical health, psychological health, and economic well-being) in the future across various caregiver characteristics. Using longitudinal, nationally representative data of the Health and Retirement Study from two waves (2008 and 2010), I looked at 496 dyad units (including care recipients and couples/partners as caregivers) of community-dwelling elderly

to evaluate the impact of relative factors on the length of informal caregiving hours and whether providing more caregiving hours cause greater negative impacts on caregivers' later physical health, psychological health, and economic well-being. To answer Q1, I used a hierarchical ordinal logistic regression model to identify predisposing, enabling, and need factors from both care recipients and care recipients' and their impacts on caregiving hours. For Q2, multivariate ordinal logistic regression or ordinal least square (OLS) regression models were separately used to examine the impact of three durations of caregiving hours (providing fewer, medium, and longer caregiving hours) at Time 1 on caregivers' physical, psychological, and economic well-being at Time 2.

Findings indicate that recipients with higher functional impairment (activities of daily living (ADL) and instrument activities of daily living (IADL)) and usage of home care service by caregivers have a significant, negative impact on caregivers' length of caregiving hours. In addition, caregivers who are older and employed are more likely to provide a greater number of hours. Furthermore, caregivers who provide more hours are more likely to have a higher level of chronic illness (objective physical health). On the other hand, I found no significant associations between caregiving intensity and self-rated health (subjective physical health), psychological health, or household wealth (including assets and income). The analysis considering predisposing, enabling, and need factors from both care recipients and caregivers to unravel the complicated caregiving phenomena are presented. Implications for research, practice, and policy are drawn based on the results.

ACKNOWLEDGEMENTS

During the study and writing of this project, similar to a long-distance swim in the indoor poor, regardless of the external environment's challenges, the only goal has been focusing and continuing each stroke until the end. I have many times encountered difficulties of keeping my track ahead. Without much of the support and training provided from various institutions and people during this process, I could not have attained many of the goals or be where I am today. Without the generosity of the Taiwan Government's financial supports—three years Scholarships from Ministry of Education, my Ph.D. journey at UIUC would not have even started. Without the assistance of the outstanding training and support from the School of Social Work at UIUC, this project would not be completed.

I want to express my highest gratitude to Professor Chi-Fang Wu, my mentor, advisor, research director, dissertation chair, and friend. Without her academic training and support, I would not have been able to equip myself to handle each obstacle and move forward. Without her kind reminders and encouragements, I could not have gone through the ups and downs of the academic life. She herself showed me the example how to become a good researcher and mentor to my future students. Without her being so supportive, I would never have made such great progress in academic research.

I am also deeply thankful to all of my dissertation committee members: Professor Min Zhan, Susan Cole, and Susan Farner. Without their inclusive and tolerant support, my project would not make progress and pass on to another stage. Professor Min Zhan—Ph.D. program

director, my mentor, and friend— has been supporting and encouraging me with her selfless love regardless when or where, the significant time requirement, or my mood. Her suggestions about financial impacts and methodology significantly improved my project's quality. Professor Susan Cole— MSW program director, my mentor, and friend—has been generous with her time and wonderful recommendations about practical experiences and for each step of my learning. Without her precious input and support, I could not have survived until now. I am also grateful to learn from Dr. Susan Farner. Her knowledge of health care and suggestions about the usage of long-term care services as well as her personal caregiving experiences have enriched my research framework and connected research to practice which has helped me unravel the complicated phenomena of caregiving.

I am also thankful to Professor Mary Keegan Eamon, who showed me the excellent example of efficient time management and rigorous attitude and scholarship on research. Although she is retired, her influences will last forever. In addition, Dr. Tara Earls Larrison—my teaching instructor, mentor, and friend—demonstrated how to integrate social work value and students' self-determination into teaching and planted the seeds to help me grow in my own pace and strengths. Furthermore, I want to express my gratitude to two men, Claude Cole and Huang-Tai Lin, who are perfect models for me to learn and become a good man, husband, and father. As my life mentors with generosity, kindness, and wisdom, they shared with me how to deal with the challenges in daily life, which are precious life experiences and inspirations.

Last but not least, I am extremely grateful to my wife Ming Chun Lee, my best friend, being mentor, and life companion. Ming Chun's wisdom, advice, magnanimity, kindness, and sacrifice are incomparable, and have grown and sustained me through my work career and Ph.D. program. From her, I always learn the selflessness for the sake of others, and the pure heart to be a noble man. She knew when I needed additional improvement, when I was overly optimistic as well as when I needed inspiration, especially when I was at a low tide. If I recalled what the most correct decision I made in my whole life, it should be the decision of marrying her as my life mate. Besides, I appreciate my two cute and lovely kids Erik and Peter, forgiving my absence of several weekday nights and weekend as well as allowing me to participate in their growth and enjoy diverse music and sport competition and recreations, which are full of joy and delights of relieving my pressure and enriching my life experiences as their father. My mother, father, mother-in-law, and father-in-law always cultivate and guide me with their wisdom and endless patience. Like the sea lighthouse in the darkness, I cannot sail and explore the world without them.

Another stage of my academic career begins, and new challenges will be presented. I am still in the process of learning by doing through many trials and tests and I strongly believe that I will still be benefit from the endless help from people who surrounding me. I will continue to embrace a vigilant and grateful heart to cherish each moment of the following journey regardless of my family and academic life, devoting what I learned to my family, the field of social work, and society.

I want to use the following song to celebrate my fulfillment of the requirement for the degree of Doctor of Philosophy and express my deepest gratitude to those people who help me during my journey.

Composer: Chan Kwong Wing (作曲：陳光榮)
Lyrics: Anders Lee (填詞：Anders Lee)
Arranger: Chan Kwong Wing (編曲：陳光榮)

https://www.youtube.com/watch?v=-h1a10qWUos

Proud of You

Love in your eyes
Sitting silent by my side
Going on holding hand
Walking through the nights
Hold me up hold me tight
Lift me up to touch the sky
Teaching me to love with heart
Helping me open my mind

I can fly
I'm proud that I can fly
To give the best of mine
Till the end of the time
Believe me I can fly
I'm proud that I can fly
To give the best of mine
The heaven in the sky

Stars in the sky
Wishing once upon a time
Give me love make me smile
Till the end of life
Hold me up hold me tight
Lift me up to touch the sky
Teaching me to love with heart
Helping me open my mind

I can fly
I'm proud that I can fly
To give the best of mine
Till the end of the time
Believe me I can fly
I'm proud that I can fly
To give the best of mine
The heaven in the sky

Can't you believe that you light up my way
No matter how that ease my path
I'll never lose my faith

See me fly
I'm proud to fly up high
Show you the best of mine
Till the end of the time
Believe me I can fly~
I'm singing in the sky
Show you the best of mine
The heaven in the sky

Nothing can stop me
Spread my wings
so wide

Dedicated to my wife, two sons, mother, father, mother-in-law, father-in-law, sisters, brothers, sisters-in-law, and brothers-in-law

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Background

Many industrialized countries have been experiencing increased life spans in their populations, along with declining fertility rates. This phenomenon is shifting the age distribution of the countries' populations, leading to aging societies. The influence of the aging population is affecting many fields, including health spending, retirement policies, utilization of long-term care (LTC) services, workforce composition, and later life's social security (Anderson & Hussey, 2000). Recently, the issue of LTC has attracted the attention of many policy makers and scholars.

1.2 Population Projection

According to a U.S. Census Bureau's projection (2010), as baby boomers (people born between 1946 and 1964) move into the age 65 and older category, the old-age dependency ratio (the number of people aged 65 and older as a proportion of the number of people between 20 and 64, multiplied by 100) is projected to rise gradually from 22 % in 2010 to 35 % in 2030. The higher old-age dependency ratio leads to a greater potential burden in health spending, long-term services and supports (LTSS), and retirement. Therefore, health care spending, especially LTC expenditures, both for institutional settings and age-in-place support organizations, will play a major role in LTC polices.

In addition, among those frail elders who need LTC, around 78% live in the community and depend on family members and friends, informal caregivers as their only source of help; 14% receive a mixture of informal and formal care; and only 8% use formal care or paid help (Thompson, 2004). These figures indicate that the majority of frail elderly are cared for by informal caregivers in community settings where this type of care constitutes a substantial

portion of the total health sector. Furthermore, 41.3% of these are adult children (such as daughter, daughter-in-law, son, and son-in-law), 38.4% are spouses, and 20.4% are other family members or friends (Wolff & Kasper, 2006)

Although the demands of LTSS among baby boomers will increase tremendously, the supply of informal caregivers will comparatively decrease (Feinberg & Reamy, 2011; Leutz, 2010; Miller, 2012). Of even more concern, the baby boomers' caregivers, as a sandwich generation, will also need to meet their own children's needs, which may lead to physical and psychological health problems and economic disadvantages.

1.3 Financial Issues

In the U.S., with the baby boomers' growing needs and increasing disabilities, shortfalls in both federal and state budgets are forecast because of the increased demand for LTSS financed by Medicaid, as well as benefits from Medicare and Social Security (Congress Budget Office, 2012; O'Shaughnessy, 2011). According to the CBO's (2012) projection, spending on major federal health care programs alone will double from more than 5 percent of the GDP in 2012 to almost 10 percent in 2037 and will continue to grow, which might be hard to sustain long term without any reforms. Most states also face the dilemma of balancing statewide standards to control the growing budget, while tailoring individualized options to meet each care recipient's needs in LTSS (Feinberg, 2005).

To decrease caregiving costs and improve the quality of elders' lives, the current LTC policy in the United States is more inclined to substitute home and community-based services (HCBS) for nursing home arrangements (Miller, Allen, & Mor, 2009). In addition, compared to nursing home facilities, assisted living or HCBS can provide elderly residents with more private, autonomy spaces where they have more control over their own lives usually at lower cost

(Lockhart, Giles-Sims, & Klopfenstein, 2009). These policy trends, however, are based on the assumption that families can or should play the primary role in the care of frail elders, (Montgomery, 1999) and treat informal care as the bedrock and a vital partner of the U.S. healthcare system (U.S. Department of Health and Human Services, 2005). However, these policies and practices neglect the unequal distribution of the care burden on women, low-income persons, and members of racial/ethnic minorities. They also do not take into account the hidden costs of informal elder care and underestimate the national economic value of informal caregiving (Arno, Levine, & Memmott, 1999). These problems can affect the well-being of caregivers, and when their well-being is diminished, informal caregivers can become impoverished seniors themselves in the future, which will translate into still greater societal burdens and costs in the future (Fast, Williamson, & Keating, 1999). For instance, states may try to reduce formal care costs by encouraging elders to depend in HCBS rather than being institutionalized, thus transferring related costs to care recipients and their families. This cost-saving strategy will lower informal caregivers' abilities to accumulate assets, which, in turn, will cause decreased assets as they age (Wakabayashi & Donato, 2006).

According to Fast, Williamson, and Keating (1999), informal caregivers frequently experience three main types of economic costs: out-of-pocket, employment-related, and unpaid labor. Informal elder care also has a strong association with a broad range of hidden costs such as sacrificing work opportunities such as promotions, as well as decreased pension benefits in the future, which increases caregivers' economic burdens (Dosman & Keating, 2005). For example, according to the MetLife Study of Caregiving in 2011, on average, nearly $304,000 (range from $283,716 for men to $324,044 for women) is lost in wages and benefits over a caregiver's lifetime. In addition, evidence also shows that caregiving is always accompanied by substantial

stress and burden, which have negative effects on caregivers' physical and psychological health (Pinquart & Sörensen, 2005; Pinquart & Sörensen, 2006; Pinquart & Sörensen, 2007; Pinquart & Sörensen, 2011).

1.4 Purpose of this Study

In general, there has been an increase in research on aging, across the fields of nursing, public health, sociology, and social work. Most scholars use Andersen, Aday and Newman's (2005) "behavioral model" to assess, illustrate, and demonstrate related factors which affect the utilization of formal and informal LTSS, and to clarify how these factors shape disparity and various arrangements in informal care among the different regions, genders, classes, and ethnicities (Mui & Burnette, 1994; Wallace, Levy-Storms, Kington, & Andersen, 1998). Other scholars have focused on investigating the unmet needs and financial burdens either among the frail elderly or their informal caregivers, without considering the compounding effects of each side's unmet needs (Arno, Levine & Memmott, 1999; Fast, Williamson & Keating, 1999).

Along with the concerns about rapid growth in the aging population and drop in numbers of informal caregivers, the financial burdens on federal, state, and individual family budgets are also causing a lot of attention. Previous studies provide limited understanding of the factors both care recipients and family caregivers face that influence caregivers' ability to offer care-time and its associated impact on physical, psychological, and economic well-being. Some scholars have pointed out many middle-aged women who start caregiving are more likely to reduce working hours or stop working altogether (Pavalko & Artis, 1997) and also found that caregiving also affected the timing of retirement (Dentinger & Clarkberg, 2002). Determinants of informal caregivers' time-spent on caregiving are less well understood. Nevertheless, empirical studies rarely have considered both care recipients' and caregivers' characteristics. Prior studies have

emphasized the influence of factors at the individual level on caregiving and caregivers' outcomes, without looking at both care recipients' and caregivers' characteristics. This may oversimplify the complexities of the caregiving phenomenon.

In addition, informal caregiving is not only time-intensive and costly, but it also entails both physical and emotional strains (Dyck, 2005). Although many studies have investigated the influence of caregiving on caregivers' outcomes, most studies fail to do integrated studies of their outcomes and rather focus on either physical or psychological health (Pinquart & Sörensen, 2005; Pinquart & Sörensen, 2006; Pinquart & Sörensen, 2007; Pinquart & Sörensen, 2011) or economic wellbeing (Greenfield, 2013; Wakabayashi, 2010; Wakabayashi & Donato, 2006). Far less is known about the impact of caregiving on physical health, psychological health, and economic well-being taken as a whole. The advantages of a more complete understanding of the confluence of these factors could inform gerontology policy makers and practitioners to develop more appropriate long-term care support systems and services for care recipients and caregivers.

My work, therefore, contributes to understanding the complex landscape of caregiving by highlighting and analyzing the dyadic relationships of care recipients and informal caregivers. Furthermore, this study explores the influence of caregiving on multiple outcomes, including physical health, psychological health, and economic well-being. Taking the dyadic interaction into consideration helps unravel the complex phenomena and enriches the understanding of caregiving, providing useful implications for gerontology practice, academics, and policy. Both adult children and couples/partners (41.3% and 38.4%) play important roles in providing informal care (Wolff & Kasper, 2006). As a result, spouse/partners often provide primary informal care as a frontline helper until they themselves become too infirm to provide care. In addition, compared with adult children providing care to their parents, studies found that

spouse/partner caregivers are more likely to increase detrimental health related risks and economic burdens of caregiving, for a number of reasons. These reasons include their older age and associated morbidities, co-residing with the care recipients, taking personal responsibility, fewer options in terms of a caregiver's role, and unawareness of potential over burdens that caregiving is taking on them (Adelman, Tmanova, Delgado, Dion, & Lachs, 2014; Burton, Newsom, Schulz, Hirsch, & German, 1997; Capistrant, Moon, Berkman, & Glymour, 2012). Therefore, in order to capture determinants of informal caregiving from both care recipients' and caregivers' perspectives as well as understand the effects of caregiving on caregivers' outcomes, this study focuses only on spouses/partners as informal caregivers. With the findings from this study, gerontology practitioners and policy makers can consider the perspectives of both the recipients and caregivers to design and provide better intervention and supportive programs.

CHAPTER 2

LITERATURE REVIEW

2.1 Theories on the Informal Caregiving and its Impact

Andersen's "behavioral model" is the most widely used analytical framework adopted by researchers to explore the relationships between individual factors, health services use and health status (Andersen & Aday, 1978; Andersen, 1995). In gerontology, family members are often the primary source of care for the elderly. In order to strengthen the widely-acknowledged deficiency of neglecting family-related factors in the Andersen model of service use, scholars such as Bass and Noelker (1987) expanded Andersen's conceptual framework by incorporating predisposing, enabling and need characteristics of both the primary caregiver and the elder care recipient. Through reviewing gerontological research findings on family care, they emphasize that considering more fully integrated informal supports (such as primary informal caregiver's characteristics) into the Andersen model is crucial. Caregivers' predisposing factors (such as age and sex), need factors (such as activity restrictions, changes in physical health, and task burden) and income and assets as enabling factors are included in the expanded Andersen's behavioral model, which helps explore the arrangements of long-term care services. Even when considering the impacts of informal caregiving on caregivers' later outcomes, Andersen's expanded framework also provides insights into how caregiving time arrangement and caregivers' outcomes are strongly affected and associated with both caregivers' and care recipients' individual characteristics.

2.1.1 Andersen's Behavioral Model

Andersen and Aday (1978) developed a "behavioral model" (see Figure 2.1) to examine the relationship among key factors. (e.g., predisposing factors, enabling factors, and need factors) health services use and health status. They hypothesize those sequences of conditions influence whether or not people use services and, ultimately, these conditions influence their health status. In 1995, they -proposed a revised theoretical framework to explain the mechanism in detail. Although their models were most used for general health service studies, Andersen's conceptual model has often been adopted as an organizing framework for many empirical studies because categories of predisposing, enabling, and need variables also will affect the ultimately health status. Although most scholars have used this model to analyze health use and ultimate health outcomes, recently, it has also been adopted to analyze how informal caregivers spend their time (Weiss, González, Kabeto, & Langa, 2005) as well as to examine the impacts of caregiving on the physical, psychological, and economic well-being of care providers.

Predisposing Factors. Predisposing variables refer to demographic and social characteristics, such as age, gender, level of education, race/ethnicity, marital status, number of children, number of resident children, children' living distance, and employment status. These demo-social characteristics of both care recipients and caregivers also affect care recipients' care arrangements and caregivers' time. Scholars often take demographic and social characteristics and personal beliefs about health services into account when analyzing the care service arrangements. In many empirical studies, most researchers adopt variables from either care recipients' or caregivers' demographic features, including age, gender, race/ethnicity, education, marital status, number of children, living distance from their children, and employment status in model analysis (Chang, Chiou, & Chen, 2010; Coninsky et al., 2003; Stoller & Cutler, 1992).

Similar to role theory, caregivers' predisposing factors, particularly number of children, marital status, living distance, and caregivers' employment status, affect their time spent on caregiving due to the multiple roles and tasks, which in turn, affect their ultimate physical, psychological, and economic well-being (Pavalko & Woodbury, 2000).

Enabling Factors. Enabling variables refer to the social and monetary resources that the person accesses from their family or the community, such as household income and assets, health insurance, and access to health services. The concept of enabling factors refers to a person's ability to acquire health services provided through personal resources and access to health care in the community (Weiss, González, Kabeto, & Langa, 2005). For example, the care recipient's household income, insurance coverage, living arrangement, and home ownership will affect LTC arrangements, health care use, and informal caregiving.

Need Factors. Need explains the degree of impairment, including physical, cognitive, and mental health status of a recipient. If care recipient's level of impairment deteriorates and he or she needed more professional care that was beyond the informal caregivers' capacities, care recipients often were transitioned to institutionalized facilities. Functional impairment activities of daily living (ADL) and instrument activities of daily living (IADL), are used to represent the degree of impairment and the physical function domain of an elderly care recipient. Studies showed that the higher level of need of care recipients and poor health condition of informal caregivers both affect the informal caregivers' time spent on caregiving (Pavalko & Woodbury, 2000). The findings also echo the stress theory's illustration that the higher the need level, the higher the likely stress on the caregiver, which in turn, will increase the physical, psychological, and economic burdens (Pearlin et al., 1990; Townsend et al., 1989).

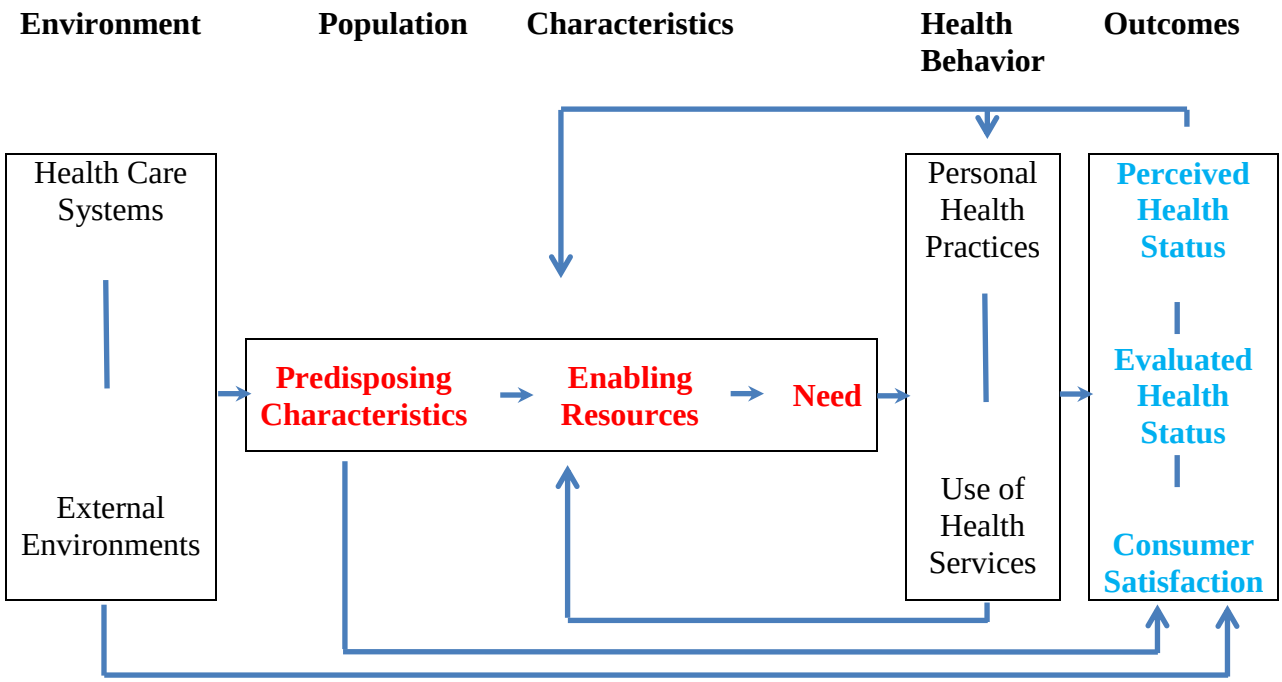

Figure 2.1 Andersen's emerging behavioral model and access to medical care. Adapted from "Revisiting the behavioral model and access to medical care: Does it matter?" by R.M. Andersen ,1995, *Journal of Health and Social Behavior, 36*(1), p.8.

In brief, this behavioral model can be applied to explain how predisposing, enabling, and need factors not only affect care recipients' and caregivers' decisions regarding a specific arrangement of care over other alternatives, but also their perceived and evaluated health status and consumer satisfaction. Although Andersen's behavioral model also emphasizes health care systems and external environments, most empirical studies seldom analyze the influences of environmental factors because of the limitations of available data. In addition, except for some scholars who began expanding the model by emphasizing the dyad of analysis units on caregiving research (e.g., Bass & Noelker, 1987; Hong, 2009); most empirical studies do not take the dyadic unit of analysis into consideration. These include factors such as both care recipients' and caregivers' predisposing, enabling, and need factors in modeling (Milligan & Wiles, 2010). Overall, Andersen's (1978) "behavioral model" provides a useful theoretical framework for analyzing the determinants of informal caregivers' time spent on caregiving, as well as

caregivers' outcomes in term of physical, psychological, and economic well-being.

2.2 Empirical Studies

2.2.1 Factors Affecting Informal Caregiving

Studies using Andersen's "behavioral model" (1995) claim care recipients' or caregivers' predisposing factors, enabling factors, and need factors are primary determinants of LTC arrangements, service use, and caregiving (Cai, Salmon, & Rodgers, 2009; Coen, 1999). Furthermore, evidence shows that extended lifespan, increased independence for the elderly, changes within family structure, geographical proximity and distance, and close kinship bonds all contribute to determining whether informal caregiving will be chosen (Milligan, 2009; Wenger, 2001). For example, many studies point out that the health status and resources of both care recipients and caregivers, the availability of potential caregivers and their socio-demographic characteristics are more likely associated with informal caregivers' time spent on caregiving (Feld, Dunkle, Schroepfer, & Shen, 2010; Holly et al., 2010; Pezzin & Kasper, 2002; Reschovsky, 1989). The following section examines empirical research to show how individual level characteristics influence informal caregivers' time spent on caregiving.

Andersen's "behavioral model" (1995) was often adopted by scholars to examine and illustrate why predisposing factors (social-demographic characteristics), enabling factors (household income and private health insurance and accessibility of resources), and need factors (functional disabilities [ADL and IADL], cognition and memory problems) as primary determinants of informal caregivers' time spent on caregiving.

2.2.1.1 Predisposing Factors

Care recipients

The relationship between care recipients' predisposing factors (e.g., demographic and social

characteristics and health beliefs) and informal caregivers' caregiving has been discussed broadly (Cai et al., 2009; Feld et al., 2004; Fennell, Feng, Clark, & Mor, 2010; Jenkins, 2001). From Dilworth-Anderson, Williams, and Gibson's (2002) literature review (1980-2000), evidence shows the significant effects of care recipients' age, gender, race/ethnicity, education, marital status, and number of children on informal caregiving. In a more recent study, Holly et al. (2011) found that age, gender, and education accurately predict the amount of formal care used. They pointed out that older age affects both informal care and formal care used, while gender only affects the probability that children provide care. However, they focused only on informal care provided by adult children. In addition, Cai et al. (2009) explore the factors associated with long-stay nursing home admissions among the U.S. elderly population using the Health and Retirement Study, (HRS) coupled with the Assets and Health Dynamics among the Oldest Old (AHEAD) surveys. Using four waves of data (1995, 1998, 2000, and 2002) of the HRS coupled with AHEAD, they found that elderly, male, non-Hispanic Whites are more likely to have an earlier long-stay nursing home admission. It seems to follow those adults who are older, male, and non-Hispanic Whites are less likely to use informal care.

Race/ethnicity was also found to be a factor in who provides care. Feld et al.'s (2004) study showed that married black elders are more likely than white elders to have informal helpers or networks other than their spouse to support and share the caregiving. Jenkins (2001) found that White widows are more likely to use nursing home care and formal-only care when compared with Black widows, even when the author controlled care recipients' level of impairment and resources. Wallace et al. (1998) found that older African Americans, compared to Whites of the same age, are less likely to use nursing homes. The barriers to equitable access and reluctance to use long-term services and support may also be a result of the minority culture, gender

expectations, vulnerable class, and/or mainstream or administration discrimination. All these factors may shape the persistent effects of ethnicity on care.

The number of accessible caregivers also affects who provides care. Studies showed that the number of children has a positive impact on the amount of informal care received (Holly, 2010; Jenkins, 2001). For example, Jenkins (2001) found that children were a primary source for unmarried individuals in maintaining access to informal caregiving because they were more likely to lack access to other LTC resources. However, in all of above studies, only care recipients' social-demographic characteristics were studied, without considering caregivers' predisposing factors. Therefore the real influences of care recipients' predisposing factors on caregivers' time spent on informal care may be biased.

Caregivers

Beyond care recipients' predisposing factors, caregivers' predisposing factors also play an important role in providing care. Research shows consistent findings regarding the significant relationship between informal caregivers' social-demographic characteristics (such as age, gender, education, and employment status) and how they spend their caregiving time (Covinsky et al., 2003; Stone, Cafferata, & Sangl, 1987; Robison, Fortinsky, Kleppinger, Shugrue, & Porter, 2009; Wolff & Kasper, 2006). All of these studies found strong associations between caregivers' age, gender, race/ethnicity, education, marital status, numbers of younger children, employment status, living distance/proximity and their time spent on caregiving. According to the National Alliance for Caregiving and AARP's report (2009), because of traditional gender expectations, two-thirds (67%) of caregivers were female, suggesting that wives, daughters, or daughters-in-law, played important roles in informal care. Furthermore, these women were juggling part-time caregiving and full-time job requirements, putting their careers and financial futures on hold.

Many studies also showed that wives, daughters, and daughters-in-law were more likely to be informal caregivers because they have always treated caregiving as their responsibilities as well as an extension of prior domestic labor (Feld, Dunkle, Schroepfer, & Shen, 2010; Miller & Cafasso, 1992; Stoller & Cutler, 1992). This result is consistent with Pinquart and Sörensen's (2006) meta-analysis that found that female caregivers reported more hours of care provided and higher numbers of caregiving tasks, compared with male caregivers.

Stone, Cafferata, and Sangl (1987) also found that women are more likely to leave the workforce than men, particularly when caring for elderly parents. Another study showed that female caregivers, such as daughters and daughters-in-law, were more likely to reduce work hours to care for their parents or parents-in-law (Covinsky et al., 2003). Another study indicated that, among caregivers who work, women are more likely to miss working hours due to caregiving responsibilities than are men (Robison et al., 2009). However the Pavalko and Artis's (1997) study which used the National Longitudinal Survey of Mature Women (NLS) from the 1984 and 1987 waves found conflicting results. Neither personal characteristics nor employment predicted which women would start caregiving over a three year-interval. Their study acknowledged that their findings might be less likely to capture the real caregiving relationships between care recipients and caregivers, due to the shortage of characteristic details regarding care recipients, type of care provided, or caregiving hours, which are the limitations of the NLS data structure.

Joseph and Hallman (1998) found that there is a significant distance-decay effect in the average (weekly) number of hours of care between men and women. Male caregivers are more reluctant to travel farther, than female caregivers, even though women are perceived as less able to travel farther. Nevertheless, women are generally more likely to devote more time to the

longer “journey to care” than men, who are more likely to focus their time on the longer “journey to work” (Joseph & Hallman, 1998). The proximity of adult children caregivers and their employment status also strongly affect the availability of informal caregiving. The longer the distance one needs to travel and the more children are employed correlate with less available hours of informal caregiving (Holly, 2010). These findings imply that the availability of children as secondary or tertiary caregivers also has great impacts on the duration and possibility of spouse/partner provided assistance.

2.2.1.2 Enabling Factors

Care recipients

Many studies showed that care recipients’ resources (e.g., care recipients’ household income or assets), Medicaid, Medicare, private insurance (e.g., private long-term-care insurance), and access to community LTSS also affect their choices of informal or formal care (Bass & Noelker, 1987; Cai et al., 2009; Jenkins, 2001; Holly et al., 2010). Care recipients with more generous financial resources and a social network may stay in a community setting longer. Members of racial/ethnic minorities are more likely to face access limitations: low income, lack of health insurance, language barriers, cultural factors, and comparatively low access to care services. For example, Holley et al.’s (2010) study showed that care recipients with higher income are more likely to opt for formal care and less likely to receive informal care. In addition, Medicaid and/or Medicare eligibilities influence not only the existence of coverage for in-home nursing and home aide services, but also restrict the amount and duration of service use (Bass & Noelker, 1987). For example, Jenkins (2001) used a multinomial logistic regression model to examine how personal and external resources affect access to different types of care (e.g., nursing home, informal only, or a mix of helpers and self-care). He found that higher income is strongly

associated with access to external resources, including Medicaid and Medicare reimbursement rates for nursing home and home health care. Care recipients with higher incomes are not eligible for Medicaid LTC aid. Therefore they need to spend a higher portion of income on of out-of-pocket expenses for home health care services. However, lower income recipients are less likely to be able to afford out-of-pocket nursing home care if the nursing home does not accept Medicaid's reimbursements. He further pointed out that widows at the lowest and highest levels of income are more likely to use nursing home care. In addition, Cai et al.'s (2009) study showed that care recipients who are not homeowners and live by themselves are more likely to go for institutionalized facilities rather than using informal care.

Caregivers

In addition to the distance between care recipient's and caregivers' residences, the available number of informal caregivers, the number of caregivers' young (dependent) children, and caregivers' employment status; informal caregivers' resources, such as income and assets, may also influence the provision of informal care. Few studies could be located to document the relationship between caregivers' resources and care provision. For example, Feld et al. (2010) found that the poverty ratio has no significant influence on spouses as the sole providers of IADL care to their partners. In addition, one study pointed out that caregivers with adult day service use are more likely to reduce primary caregiving hours, compared to non-users (Gaugler et al., 2003). However, the generalization of this finding needs to be cautious because the caregivers were only from New Jersey rather than representative, national data set. Besides, the short period of observation (three months), higher attrition rate, and the different characteristics among some variables between treatment and control group in the baseline, which are the limitations to affect the real causality.

2.2.1.3 Need Factors

Care recipients

Care recipients' level of impairment and functional disability (ADL and IADL), and cognitive and memory problems play an important role in informal caregivers' time spent on caregiving. Several studies showed that care recipients with psychiatric problems, higher ADL and IADL index scores, worse cognitive impairments, number of chronic illnesses, and worse self-perceived health status were more likely to live in an assisted community for a shorter time (Cai et al., 2009; Feld et al., 2010; Strain & Blandford, 2002). For example, Cai et al.'s (2009) study found that care recipients with higher IADL were more likely to be admitted to a long-stay nursing home (LSNH). However, higher ADL did not show a significant effect on LSNH home admissions. This suggests that informal caregivers have difficulties handling care recipients with higher IADL functioning or serious cognitive and psychiatric problems.

Caregivers

Caregivers' perceived health, health deficits, and functional disabilities also affect their capacities to provide care for relatives who may have a number of functional limitations (Feld et al., 2004; Feld et al., 2010). Most studies focused on the effects of care recipients' need factors on decisions about informal caregiving rather than caregivers' need factors. Feld et al.'s (2004) study from the first wave of the AHEAD survey showed that spouses without IADL limitations are more likely to provide informal care as solo caregivers. In addition, Feld et al.'s (2010) study showed that care recipients' ADL and IADL functioning had great impacts on the likelihood of the spouse being the sole IADL caregiver. The strengths of Feld et al.'s (2010) study were that they incorporated need factors of both care recipients and caregivers and the number of children into model consideration. However, they did not consider predisposing and enabling factors of

caregivers.

2.2.2 Research about Impacts of Caregiving on Physical, Psychological, and Economic Well-Being

Although caregiving may provide positive benefits and rewards to caregivers, such as a sense of usefulness, accomplishment, family appreciation, and companionship, when family caregivers lack enough support and resources and provide intensive care to their loved one, they were more likely to suffer physical and psychological health problems and financial losses (Bastawrous, 2013).

Researchers further pointed out that more time spent on caregiving was strongly associated with poor physical health, emotional strain, interference with work (reduced working hours or withdrawal from the labor force), shortage of sufficient time for self and family, and financial burden (Earle & Heymann, 2012; Holicky, 1996; Lin et al., 2012; Pavalko & Woodbury, 2000; Robison et al., 2009). In the long-term, providing care may limit opportunities to participate in regular social activity, exercise, and employment. Caregivers are not only more likely to neglect their own health and ignore health-promoting behavior, but also to experience increased financial hardships and reduced pension benefits due to intensive caregiving responsibilities. And when informal caregivers attempted to return to the job market, they had difficulties recovering or finding jobs (Pavalko & Artis, 1997). Such experiences might bring adverse consequences, including physical, emotional, and financial strain for caregivers. Therefore, they become the hidden victims of illness and disability (Holicky, 1996).

2.2.2.1 Caregiving and physical and psychological health

Through a comprehensive meta-analysis on differences between caregivers and non-caregivers in physical and psychological health, evidence showed that, due to their caregiving experiences, caregivers report worse psychological symptoms, such as stress, depression, and

lower subjective well-being, self-efficacy, and physical health than non-caregivers (Pinquart & Sörensen, 2003; Pinquart and Sörensen, 2005; Pinquart and Sörensen, 2006; Pinquart and Sörensen, 2007; Pinquart and Sörensen, 2011; Van Houtven, Voils, & Weinberger, 2011). Other studies also showed that informal caregivers, especially those who are taking care of the frail elderly, suffer from these stressful conditions: depressive symptoms, health problems, work loss, and social isolation (Beach, Schulz, & Yee, 2000; Kuzuya et al., 2011; Levine, Halper, Peist, & Gould, 2010; Mahoney, Tarlow, & Jones, 2003; Ness, 2011). Frequently, personal self-rated health and chronic illness were often referred to measure physical health. In addition, qualities of life, measurement of mood or helplessness, or change in depressive symptoms were used to represent psychological health (Van Houtven et al., 2011).

For example, Convinsky et al.'s (2003) study pointed out the relationship between hours spent on caregiving and depressive symptoms. People spending more hours on caregiving were more likely to report higher percentages of depressive symptoms (e.g., hopelessness, fatigue, isolation, and unhappiness). In addition, this study found other characteristics of both care recipients and caregivers had influences on these depressive symptoms. However, the study at a specific point (cross-sectional sample) focused particularly on care recipients with dementia. The weakness of this study was that the researchers did not further clarify the relationships (such as spouse/partner or others) between care recipients and caregivers. This lack of clarification may fail to account for dissimilar influences on symptoms due to different caregiving relationships.

In addition, Robison et al. (2009) used the 2007 Connecticut Long-Term Care Needs Data (N=4,041) and adopted logistic regressions to analyze the impacts of caregiving experience on six health and psychosocial outcomes, including depressive symptoms, missing work, social isolation, self-rated health, dental cleanings, and wellness visits. They found that caregiving per

se did not lead to symptoms of depression, lower self-rated health, or social isolation, compared to non-caregivers. Although this study incorporated some characteristics of both care recipients and caregivers into model analysis, its weakness was that the researchers did not measure the hours of caregiving, which might be the reason that they did not find the strong association between caregiving experience and six health and psychosocial outcomes.

Beach, Schulz, and Yee's study (2000) used 2 waves of the Caregiver Health Effects Study (n = 680), a population-based sample of elders caring for disabled spouses, to examine the effects of caregiving involvement on caregiver health. They found that the level of care recipients' impairment are more sever, it will affect the caregivers more by increasing caregiver strain and anxiety, caregivers were more likely to have poorer outcomes over time, including poorer perceived health, increased health-risk behaviors, and increased anxiety and depression. A strength of this study is that it included health-related outcomes including self-rated health, health-risk behaviors, anxiety symptoms, and depression symptoms. In particular, its evaluation of health-risk behavior gave several indicators which were very inclusive, including eating less than three meals a day; not having enough time to exercise; not getting enough rest in general; not being able to slow down and get needed rest when sick; forgetting to take medications; delaying a doctor visit if a health problem is suspected; and missing one or more doctor's appointments in the last 6 months. However, this study calculated the items of providing ADL or IADL caregiver help as the measurement of the involvement of caregiving. This kind of measurement might be too simple to capture the real caregiving experiences, such as hours spent on caregiving.

2.2.2.2 Caregiving and economic well-being

Compared to a large body of empirical studies which have been conducted to assess

caregiving's influence on either physical health or psychological health, as discussed above, knowledge of the effects on economic well-being are relatively scarce because of limitations of some previous studies. One weakness of these economic well-being studies is that most research used theoretical approaches to estimate the impacts of caregiving on financial burden, rather than adopting empirical studies (Bastawrous, 2013; Dosman & Keating, 2005; Fast, Williamson, & Keating, 1999; Metlife Mature Market Institute [MMI], 1999; NAC/AARP, 2009; Stone, Cafferata, & Sangl, 1987). Some studies just used a cross-sectional dataset rather than a national representative longitudinal dataset, which makes it hard to capture the causality and generalize (Toseland, & Smith, 2006; Weuve, Boult, & Morishita, 2000). Another study just measured the caregiving hours at the baseline and neglected the continuity of caregiving experiences between observing periods (from time one to time two), which might oversimplify the effects of caregivers' caregiving experiences on economic well-being in later life (Wakabayshi & Donato, 2006).

Existing studies have three different approaches to document the effects of caregiving experiences on economic well-being. The first approach only examined the effects of costs of health care services consumed on economic status (Toseland, & Smith, 2006; Van Houtven et al., 2011; Weuve, Boult, & Morishita, 2000). Total medication, hospital, outpatient, and emergency room costs were examined in these studies. However, this approach seldom considered effects on care recipients' economic status beyond health care costs (Van Houtven et al., 2011).

The second approach measured the influences of caregiving hours on risks/possibilities of living in poverty (Wakabayshi & Donato, 2006; Wakabayshi, 2010). For example, Wakabayshi and Donato (2006) found that caregiving earlier in life made it more likely for women's poverty risks to rise later by intensifying the negative effects of leaving work and declining health on

medical spending. They adopted three indicators to capture the economic well-being: 1) the risk of living in poverty (such as household income less than 200% of Federal Poverty Line; 2) the likelihood of receiving public assistance from Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF), or food stamps; and 3) the likelihood of receiving Medicaid. However, this approach may not capture economic well-being holistically because Medicaid did not take home and business equity into account when evaluating one's eligibility for Medicaid (Greenfield, 2013). Although one's home is not a routine source of income, care recipients and caregivers may still borrow money against the value of the home when emergency funds are needed.

The third approach measured the impacts of caregiving experiences on the wealth, including household income (such as Social Security and pensions) and household assets (the sum of saving, investments, and home and business equity, minus any debts) reported by the respondent. In addition, RAND HRS also provided income and wealth imputation files for these variables; therefore, scholars more often adopted the third approach when they used HRS dataset (Engelhardt, & Kumar, 2011; Greenfield, 2013; Shen, 2010). For example, through following six waves of the HRS (1998-2008), Greenfield (2013) adopted latent trajectory analysis to identify whether caring for aging parents impacted caregivers' assets over time. In this study, a four-group model fit best and only one group with 4.3% of respondents had a significant negative relationship. In addition, care duration (for example, being a caregiver for at least 100 hours in the past 12 months) had no significant impact on asset trajectories and care intensity (for example, the number of caregiving hours) had different/mixed effects. Since the respondent's wealth is divided by the number of wage earners included in the household because assets and debts were measured at the household level, without incorporating the exact characteristic of the

caregivers' spouse/partner's relationship into the model consideration, it might have confounded the real results.

2.3 Predisposing, Enabling, and Need Factors and its Impact on Physical, Psychological, and Economic Well-Being

Many studies showed that individual factors, including predisposing, enabling, and need factors of both care recipients and caregivers affect informal caregivers' psychological health, physical health, and economic status (Chwalisz, Dollinger, Zerth, & Tamkin, 2011; Gaugler, Mittelman, Hepburn, & Newcomer, 2009; Gaugler, Mittelman, Hepburn, & Newcomer, 2010; Van Houtven et al., 2011; Yee & Schulz, 2000).

2.3.1 Predisposing Factors

Care recipients

A large body of studies used multivariate regression or logistic models to analyze the relationship between care recipients' demographic and social characteristics and caregivers' well-being (Covinsky et al., 2003; Lin, Fee, & Wu, 2012; Robison et al., 2009; Yates, Tennstedt, & Chang, 1999) but showed diverse findings. For example, Convinsky et al.'s (2003) study focused on depression in caregivers for recipients with dementia; they found that care recipients' characteristics significantly affect caregivers' higher risk of depression, and, further, that these characteristics include younger recipient age, white or Hispanic ethnicity, and lower education level, compared to the older recipient's age, black ethnicity, and level of higher education. Other studies also showed that caregivers who live with the care recipients, care for a younger elderly individual, and care for someone with memory problems all predict one's risk of depression (Robinson et al., 2009). However, one study found that caring for females and caring for older care recipients all predict poor physical and psychological health (Lin, Fee, & Wu, 2012). Conversely, Beach, Schulz, and Yee (2000) found that socio-demographic variables have weak

relationships to health-related outcomes. They also pointed out that caregivers in committed relationships are more likely to report better outcomes when they have higher quality relationships.

Caregivers

Caregivers' age, gender, race or ethnicity, education, marital status, relationship with care recipients (e.g., spouse/partner or adult children), number of children, co-residence, employment status, and caregiving experiences (including involvement: hours of care/travel hours, length of time of care, and task of care) are significant factors that strongly predict informal caregivers' physical, psychological, and economic well-being (Arnsberger, Lynch, & Li, 2012; Bianchi & Milkie, 2010; Pinquart & Sörensen, 2005; Pinquart & Sörensen, 2006; Pinquart & Sörensen, 2007; Pinquart & Sörensen, 2011; Robison et al., 2009; Vitaliano, Zhang, & Scanlan, 2003). Studies showed that caregivers who are male and older, who are more highly educated and employed full time, and who are not living with the care recipients, all predict higher self-assessed health (Arnsberger et al., 2012; Lin et al., 2012). For example, Arnsberger et al.'s (2012) study showed that increasing age of informal caregivers is associated with higher risk of low self-assessed health. In addition, the literature has comprehensively established that gender and race or ethnicities are strong factors predicting informal caregivers' outcomes. Evidence showed that women caregivers are more likely to feel stressed than men (Miller & Cafasso, 1992; Walker, Pratt, & Eddy, 1995). Similar to Pinquart and Sörensen's (2006) meta-analyses, these researchers concluded that caregiving women report poorer physical health than do caregiving men. Furthermore, they also adopted a comprehensive meta-analysis on ethnic difference in stressors, resources, and psychological outcomes of family caregiving and found that most studies showed that African-American caregivers self-rated higher psychological health

and lower physical health than White caregivers (Pinquart & Sörensen, 2005). They also found that Hispanic Americans report poorer physical and psychological health than did non-Hispanic Americans, which illustrates that these minority populations of caregivers often report poorer physical health status than do Caucasians.

Two studies have documented that caregivers who live with care recipients are more likely to experience psychosocial distress (Covinsky et al., 2003) and depressive symptoms (Robinson et al., 2009). Moreover, some studies showed that spousal caregivers have worse mental health outcomes than adult children who are caregivers (Covinsky et al., 2003; Ostwald, 2009; Zivin & Christakis, 2007). However, most of these studies did not control for the amount of caregiving (in hours). Pabalko and Woddbury's (2000) study, using the National Longitudinal Survey of Mature Women (NLS) from the 1987 and 1989 waves, found that, among caregivers who had been providing care for two years, not only did their psychological stress average three points higher than non-caregivers, but also their physical health decreased slightly, compared to those not providing care. In addition, evidence also showed that, compared to male and spousal caregivers, female and adult-child caregivers were more likely to report negative experiences, such as physical, emotional, and financial strain; loss of privacy, limits on life, constant attention, less time for family, and give up vacations; and exhaustion, more things handle, no progress, and don't have time (Lin et al., 2012). Furthermore, Robison et al. (2009) documented that unemployed caregivers were at least three times more likely to rate their health status as poor or fair than those with jobs.

2.3.2 Enabling Factors

Care recipients

Having a low income and fewer assets, lacking health insurance, and without LTSS available

in care recipients' communities, were all factors that had negative effects on informal caregivers' physical and psychosocial health and well-being. Several studies have found that the lack of specific services (e.g., respite or adult day care) greatly increased informal caregivers' stress (Gaugler et al., 2003; Jeon, Brodaty, & Chesterson, 2005).

Caregivers

Worldwide, researchers have recently found strong associations between caregivers' income levels and their well-being (Mitrani, Vaughan, McCabe, & Feaster, 2008; Papastavrou, Charalambous, & Tsangari, 2009; Siefert, Williams, Dowd, Chappel-Aiken, & McCorkle, 2008; Vellone, Piras, Talucci, & Cohen, 2008). Research conducted in the US has shown that informal caregivers with high income levels report strongly higher scores of self-assessed health (Arnsberger et al., 2012). Robinson et al.'s (2009) study also found that informal caregivers with adequate income not only rated their health significantly higher, but also had fewer symptoms of depression than those without adequate income.

2.3.3 Need Factors

Care recipients

Need/illness of the care recipients has also been discussed in the context of informal caregiver outcomes. Most studies have indicated that those who care for specific populations with problem behaviors and dependency, including higher ADL and IADL index scores, cognitive impairment and memory problems (e.g. Alzheimer's disease), cancer, or mental illnesses, are more likely to exhibit symptoms of depression and other negative health effects (Gaugler et al., 2004; Jeon, Brodaty, & Chesterson, 2005; Sharpe, Butow, Smith, McConnell, & Clarke, 2005; Robison et al., 2009).These negative effects are accompanied by caregivers' already disadvantaged economic status (Earle & Heymann, 2012). Higher levels of impairment

in care recipients contribute to adverse outcomes for caregivers (Ko, Aycock, & Clark, 2007; McCullagh, Brigstocke, Donaldson, & Kalra, 2005). For example, Lin et al.'s (2012) study found that care recipients' problem behaviors and dependency levels contribute to adverse outcomes for caregivers, such as physical, emotional, and financial strain. Evidence showed that those care recipients' ADL and IADL difficulty scores were strongly related to poor outcomes for their caregivers at the physical and psychological levels (Beach, Schulz, & Yee, 2000). In addition, Earle and Heymann (2012) found that caregivers who provide assistance to the disabled elderly are more likely to report wage loss.

Caregivers

Evidence showed that informal caregivers with higher levels of chronic illness, impairment, or disability have significantly poorer health (Arnsberger et al., 2012; Lin et al., 2012). For example, Arnsberger et al.'s (2012) study showed that caregivers with chronic health conditions, sleep difficulties, and emotional stress are reporting a lower self-assessed health status. In addition, Lin et al. (2012) found that poor health or disability is a risk factor for caregivers' physical and psychological health (for wife, husband, and daughter caregivers, but not son).

2.4 Research Gaps and Contribution of Current Study

Prior studies emphasize the influence of either care recipients' or caregivers' characteristics on informal caregivers' time spent and its impact on outcomes. This approach overlooks the characteristics of both the care recipient and primary family caregiver, which influence the elder's arrangement of LTC and also makes it difficult to capture comprehensive insights on informal caregiving. Without taking predisposing factors, enabling factors, and need factors of both the primary family caregiver and the elder care recipient into account, findings, which may over-estimate or under-estimate the significant effects of other factors on caregiving and

caregivers' outcomes, may emerge.

Based on the literature review above, we used the expanded Andersen's behavioral model when evaluating determinants that affect informal caregivers' time spent on caregiving and its impact on caregivers' outcomes. Not only this model provides the basic framework for analysis, but also suggests scholars that integration of dyadic relationships (considering both care recipients and caregivers) has tremendous influences on frail elderly caregiving and caregivers' well-being.

Despite the large numbers of studies discussing individual level factors of either care recipients or informal caregivers' time spent on caregiving, knowledge is scarce about determinants of both the elder recipient and spouse/partner caregivers affect spouse/partner caregivers' time spent on caregiving as well as spouses/partners' caregiving experience on their later physical, psychological, and economic well-being. My study seeks to fill the following gaps in the current literature. First, there is limited understanding of how the predisposing, enabling, and need characteristics of both the primary family caregiver and the elder care recipient (from the dyad units analysis) affect time spent on caregiving. By emphasizing the dyadic of analysis units on caregiving research, this study takes both care recipients' and caregivers' characteristics into modeling consideration, which helps capture more accurate determinants of caregiving. Second, despite a growing interest in the influences of caregiving, current studies look at either physical and psychological health or economic well-being (such as wealth and poverty rate), but no studies integrates the effects of both factors.

Although the main contribution of this study is to incorporate dyad units into analyzing the influences of both care recipients' and caregivers' predisposing, enabling, and need factors on spouse/partner caregivers' time spent on caregiving, as well as caregiving's effects on physical,

psychological, and economic well-being, the study also makes several other contributions. First, although the relationships between either care recipients' or caregivers' characteristics and caregivers' time spent on caregiving, and between caregiving (hours of caregiving) and caregivers' physical, psychological, and economic well-being have been separately acknowledged by previous studies, they were rarely conducted with a nationally representative longitudinal data set. Secondly, compared with other studies, the current study uses a more comprehensive measure of outcome variables. For example, informal caregiver's physical health includes both subjective indicator (self-rated health) and objective indicators (eight chronic illnesses). Psychological health used a score on the Center for Epidemiologic Studies Depression (CESD) scale. Economic well-being is measured by wealth which totals household income and all kinds of assets, deducting all kinds of debts. Thirdly, the study is designed to determine the effects of caregiving hours on caregivers' physical, psychological, and economic well-being by controlling for predisposing, enabling, and need factors of both care recipient and caregiver. Finally, unlike previous studies in this area, the current study controlled for a prior measure of physical health, psychological health, and economic well-being in 2008 (Time 1) to minimize selection bias.

2.5 Research Questions and Hypotheses

As suggested by the expanded behavioral model, the aim of this study is to identify how those predisposing, enabling, and needs factors of both care recipients and caregivers impact informal caregivers' time spent on caregiving and its outcomes (such as physical health, psychological health, and economic well-being). Since I located few studies that examined the relationship between predisposing, enabling, and need factors of both the elder care recipient and the primary family caregiver (dyad units analysis) and caregivers' time spent on caregiving, the

study recognizes the relationships first by distinguishing the determinants of time spent on caregiving. Second, caregivers who spent more hours on caregiving were more likely to suffer physical and psychological health problems and economic hardships than those who spent fewer hours. Then, the study examines differences in these outcomes by time spent on informal caregiving among these couples with control of predisposing, enabling, and need factors of both the care recipient and the couple caregiver.

The following two research questions guide the investigation and hypotheses are proposed for future testing, based on Andersen's expanded behavioral model and prior empirical research findings:

Q 1: **What are the determinants of couple caregivers' time spent on caregiving?**

Hypothesis 1.1: If care recipients are younger, and caregivers are older, female, members of a racial/ethnic minority, with lower education, and unemployed, with more children and more living at home; the spouse/partners are more likely to spend more time on caregiving.

Hypothesis 1.2: If the couples have more family resources, such as government provided health insurance, have private long-term care insurance, use outpatient surgery, have a history of hospital or nursing home stays, and use home care services, the spouse/partner caregiver is less likely to spend time on caregiving.

Hypothesis 1.3: If the care recipients have higher ADL and IADL index scores, higher cognitive impairment, and higher memory problems, the couple caregivers are less likely to spend more time on caregiving. However, if both the caregiver and recipient have poorer health, such as the spouse/partner

caregivers have higher ADL and IADL index scores, lower cognitive impairment, and lower memory problems, they are less likely to spend time on caregiving.

Q 2: **What are the impacts of caregiving hours at Time 1 on informal caregivers' physical health, psychological health, and economic well-being at Time 2, when controlling both care recipients' and caregivers' predisposing, enabling, and needs factors at Time 1?**

Hypothesis 2.1: More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' subjective physical health (self-rated health) at Time 2.

Hypothesis 2.2: More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' objective physical health (chronic illness) at Time 2.

Hypothesis 2.3: More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' psychological health at Time 2.

Hypothesis 2.4: More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' economic well-being at Time 2.

CHAPTER 3

RESEARCH PLAN AND METHODS

To establish a conceptual care model for an increasingly LTC intensive setting, my study synthesizes theoretical and empirical knowledge (please see Figure 3.1). It uses dyad units to analyze the effects of individual level factors (Time 1) on caregivers' hours of caregiving (Time 1) but also examines the influences of caregiving on informal caregivers' outcomes (Time 2).

3.1 Research Plan, Method, and Measurement

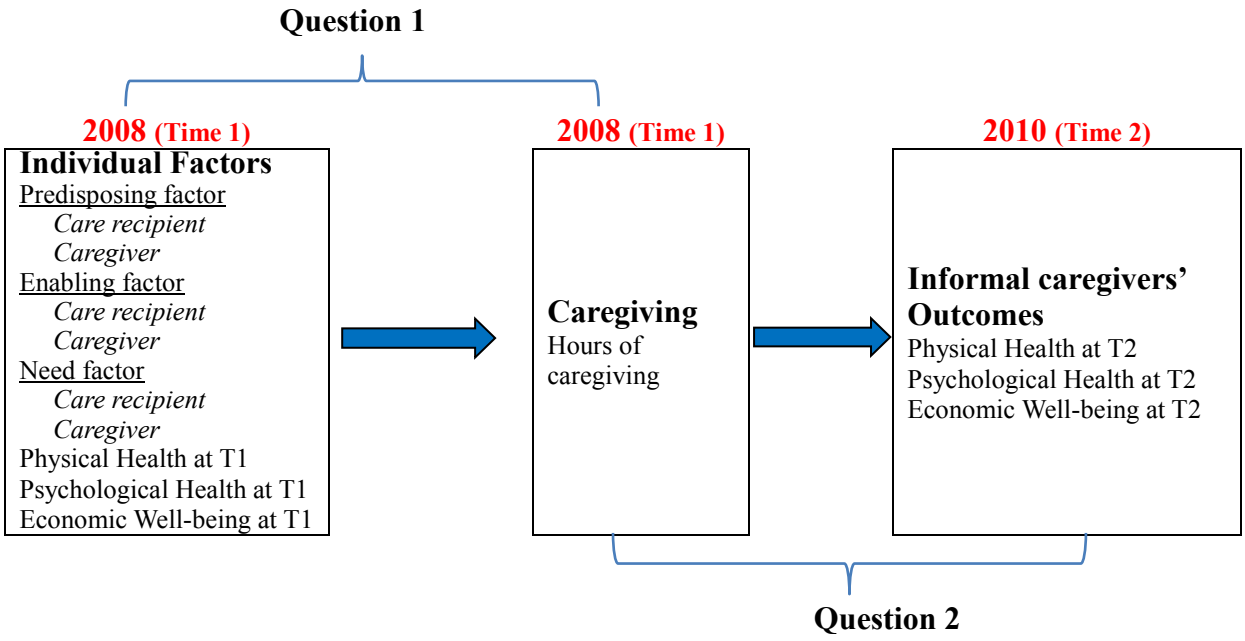

Figure 3.1 Conceptual model for conducting my proposed research

3.1.1 Data and Sample

To capture the influences of earlier caregiving experiences on informal caregivers' outcomes, this study employs secondary data analyses, using individual level data from the Health and Retirement Study (HRS) (Wakabayashi, 2010). HRS is a robust resource for analyzing individual level and national aging trends, understanding diversity and variability of

aging, and exploring causality (Karp, 2007). It is a national longitudinal study conducted by the Institute for Social Research (ISR) Survey Research Center (SRC) at the University of Michigan, which has surveyed Americans over age 50 every 2 years beginning in 1992. HRS provides information about economic status (e.g., income and assets, retirement plan), family (e.g., family structure and demographic background), health (e.g., physical and mental health status and functionality) and utilization of health services from 1992 to 2010 (Li & Jensen, 2012).

HRS database contains information on the elderly with functional limitations and their helpers (informal caregivers) in each wave and there were 17,217 respondents and household files (N=10,630) in wave 2008. In addition, household characteristics (N=10,630) and respondent files needed to be merged by household identification number (HHID) in wave 2008. Therefore, only 10,630 household and respondent files remain in the data for this study. Moreover, the samples were restricted to those who had completed interviews in both waves during the study time period. I combine the 2008 (T1) and 2010 (T2) panels with the same respondents from HRS. In addition, this study focuses on the influences of caregiving on caregivers' physical and psychological health and economic well-being from a dyad unit analysis. In order to capture informal caregiving's influence on helpers' outcomes, this study only focus on spouses/partners, rather than other relationships (such as son, son-in-law, daughter, daughter-in-law, or paid/formal caregivers). After merging household files and respondent files, and after limiting the cohort to spouse/partner helpers for dyadic units analysis, the file was narrowed to 518 cases (N=518).

Inclusion criteria at baseline for this study were: (1) respondents need ADL and IADL help; (2) respondents' helpers are respondents' spouse/partners; and (3) both respondents and their dyad helpers are alive in both waves (2008 and 2010) and had valid data (dependent variables).

These criteria further narrowed the applicable spouse/partner helper and responder files to the sample (N=496, 445, 429, 415, and 469, separately depending on dependent variables) for this study. I did a statistical analysis to detect whether there are significant differences in care recipients and caregivers, as well as household characteristics, between this study sample and the elderly not included in the study to see whether missing data caused bias.

3.1.2 Measurements

During my extensive literature review, I researched coding conventions and systems used in similar studies. Consequently, I will follow the established coding conventions utilized by Greenfield (2013), Shen (2010), and Wakabayashi and Donato (2006), because all of these researchers used HRS to do their studies, whose research was related to my topics.

This project has two research questions. The first question is to focus on analyzing the effects of both care recipients' and caregivers' predisposing, enabling, and needs factors, and on informal caregivers' time spent on caregiving. Therefore, informal caregivers' time spent on caregiving is a dependent variable, while the predisposing, enabling, and needs factors of dyad units are independent variables. The second question is to see how informal caregivers spent time on caregiving and how this affects informal caregivers' physical, psychological, and economic well-being. Therefore, individual level factors, including predisposing, enabling, and need factors are control variables. The descriptions of how these variables operated within the survey are provided in Appendix A. The following section illustrates the measurement for each question separately.

3.1.2.1 Question 1

3.1.2.1.1 Dependent Variables

Informal caregiving time (caregiving intensity) was measured by two variables: caregiving hours per day and caregiving days per week (from Section G: Functional limitations and helpers file in HRS). For continuous measure of number of hours reported in each wave, this study used the question, "On the days [HELPER WHO LOOP] helps you, about how many hours per day is that" to calculate the caregiving hours in 2008. Then a second question was posed: "During the last month, on about how many days per week did [HELPER WHO LOOP] help you?" After multiple caregiving hours by seven days, then the hours spent on caregiving per week could be calculated as a continuous variable (the range is from 0~168 hours).

The skewness of the dependent variable, caregiving hours at Time 1 was 1.97, which was more than 1.0. This indicates that the distribution of the dependent variable is highly skewed which disobeys the assumption of normal distribution of OLS regression model. In addition, according to the American Association of Retirement Persons (AARP) (2004), 20 hours of caregiving per week is the average spent by informal caregivers and 56 hours of caregiving per week is similar to a full time job as intensive caregiving. Therefore, I used 20 and 56 as dividing points to sort caregiving into three categories, therefore caregiving hours was re-categorized into three groups: few (less than 20 hours per week), medium (20~56 hours per week), and more (more than 56 hours per week as a full time job), using an ordinal logistic regression model.

3.1.2.1.2 Independent Variables

Considering dyad units, all the following factors include predisposing, enabling, and needs factors are from both care recipients and caregivers, the descriptions and measurements are illustrated below. Detailed questions about each variable are listed in Appendix A.

Predisposing factors: age, gender (1=female, 0= male), race/ethnicity (White [reference], Black, Hispanic, and other), highest education (less than high school [reference], high school graduate or GED, some college, and college degree or above), number of living children, number of resident children in 2008 (T1) (Li & Jensen, 2012).

Enabling factors: These include health plan provided by government (1= if the elderly qualified, 0= if the elderly did not qualify), amount of private LTC insurance, total annual out-of-pocket (OOP) medical spending (continuous variable), and household wealth (continuous variable) in 2008. In addition, a log transformation was applied to total annual OOP medical spending and household wealth. In addition, because wealth include various debts, incomes and assets from both care recipients and caregivers, household wealth may have negative values that the logarithm cannot deal with. For example, the household wealth range was from $-57,240 to $11,143,669 in 2008, therefore $57,240 will be added before log transformation (Shen, 2010).

Need factors: chronic illnesses, functional dependency and cognitive impairment. Chronic illnesses (such as strokes, psychiatric problems, falls and incontinence) were selected as covariates. Functional dependency **(**functionality) is measured using two indicators: the self-reported number of limitations the elder has in performing five activities of daily living (ADLs) and the self-reported number of limitations the elderly has performing five instrumental activities of daily living (IADLs). The five ADLs include bathing, dressing, eating, getting in/out of bed, and walking across a room. The IADLs include using the phone, managing money, taking medications, shopping for groceries, and preparing hot meals (Li & Jensen, 2012). Cognitive impairment is measured by whether the respondent has reported any memory problems. A lower test score indicates worse cognitive functioning.

3.1.2.2 Question 2

3.1.2.2.1 Dependent Variables

Informal caregivers' physical health, psychological health, and economic well-being in 2010 (T2) were used to capture the caregiving's influence on informal caregivers' outcomes. Physical health, psychological health, and economic well-being were all measured as interval variables.

Physical health was measured in two dimensions: subjective physical health and objective physical health. Subjective physical health is measured by respondent's self-rating, measured at the 2010 interview with one question using a 5-point Likert scale: "Would you say your health in general is excellent, very good, good, fair, or poor?"

Objective physical health is measured by adding the total number of chronic diseases for each respondent, including high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, emotional/psychiatric problems and arthritis. Respondents who have each disease mentioned above were coded as 1 and 0. The range is from zero to eight and the higher numbers indicate a poorer state of physical health.

Psychological health is measured using the same scheme as physical health, with numbers assigned to each respondent indicating the number of psychological illnesses they are experiencing. A score on the Center for Epidemiologic Studies Depression (CESD) scale is used, the CESD score (RwCESD) is the sum of six "negative" indicators minus three "positive" indicators. The negative indicators measure whether the respondent experienced the following sentiments all or most of the time: depression, everything is an effort, sleep is restless, felt alone, felt sad, and felt unmotivated. The positive indicators measure whether the respondent felt happy, enjoyed life, and felt full of energy all or most of the time. Respondents who have each symptom mentioned above were coded as 1 and 0 otherwise. The range is from zero to nine and higher

numbers indicate a poorer state of psychological health.

Economic well-being (wealth) is measured by summing both household income and household assets in 2010. Household incomes included salary or wages, Social Security, pensions, welfare benefits, interest, gifts, or anything else. Household assets were aggregated as the sum of all kind of assets minus any debts. For example, the assets included net values of primary residence, real estate, business or farm, Individual Retirement Account (IRA), stocks, bonds, checking accounts, and certificates of deposit, cars, and others assets. In addition, debt calculated as the sum of money owed on credit card balances, medical expenses, mortgage, equity loans, and other debts. Wealth ranges from negative to positive values, thus, log transformation and $\log_{10}$ transformation were separately conducted to account for the skewed distribution of this wealth variable and took the absolute value (Greenfield, 2013; Shen, 2010).

The skewness of the dependent variable, self-rated health (subjective physical health) was .11 and the number of chronic illness (objective physical health) was .31, both were less than 1.0. This suggests that the distribution of the dependent variable is not highly skewed. Therefore, it is appropriate to use the multivariate OLS regression model. Since self-rated health is measured at an ordinal level (poor, fair, good, very good, and excellent) and the categorizations for self-rated health were similarly used in prior research (Burton et al., 1997; Capistrant et al., 2012), this study combined self-rated health as poor or fair into one group. The responses were then categorized into four levels: fair or poor, good, very good, and excellent, ranging from 1 (poor or fair) to 4 (excellent).

However, the skewness of psychological health and wealth at Time 2 were separately 1.21 and 6.38, which were more than 1.0. This suggests that further steps were needed, including re-categorization of psychological health and log wealth at Time 2, to help improve the normal

distribution of the dependent variable. Therefore, ordinal logistic regression model was used to analyze, rather than the OLS regression model.

3.1.2.2.2 Independent Variables

All independent variables in this project were measured at T1 (wave 2008). Informal caregivers' time spent on caregiving was/is a key individual-level explanatory factor. Time spent on informal care for spouse/partner was measured by the number of hours weekly that the caregivers spent on caregiving at T1. This variable is treated as continuous.

3.1.2.2.3 Control Variables

My multilevel analyses include a number of covariates that were documented by prior studies using HRS (e.g., Cai, Salmon, & Rodgers, 2009; Lima, Allen, Goldenscheider, & Intrator, 2008; Wakabayashi, 2010). Care recipients' individual level factors, including predisposing factors, enabling factors, and need factors/variables were obtained at the baseline interview in wave 2008 (Time 1) as control variables to filter the real effects of earlier caregiving experiences on caregiver's physical health, psychological health, and economic well-being in wave 2008 (Time 2). In addition, we controlled for physical health, psychological health, and economic well-being in 2008 (Time 1) to minimize selection bias.

3.2 Methods of Analysis

3.2.1 Descriptive Analyses

Descriptive analyses are presented first to suggest a holistic picture from both care recipients' and caregivers' individual level characteristics in the sample. These measures include physical health, psychological health, economic well-being, time spent on caregiving, and other individual level variables (such as predisposing, enabling, and needs factors). Weighted frequency distributions and percentage for categorical variables and weighted means, as well as

standard deviations for continuous variables, were used to calculate descriptive statistics for all measures.

3.2.2 Ordinal Logistic Regression Model and Multivariate OLS Regression Model

Both research questions incorporate predisposing, enabling, and need factors of both care recipients and caregivers into the model analysis. Two or more predictor variables in a multiple regression model may be highly correlated. The coefficient estimates of a multiple regression may change erratically in response to small changes in the model or the data. Multivariate OLS regression model is based on the assumptions "no multicollinearity". Multicollinearity may not give valid and accurate regression coefficients for any individual predictor and also biased the results.

We examined the tests of correlations among all independent variables to avoid highly correlation. For example, the age of care recipients and the age of caregivers, as well as mobility and ADL are found highly correlated. Therefore, the age of care recipient and mobility are deleted to avoid mutlicollinarity. In addition, there are over half of values of cognitive impairment and lower memory problems are missing, so we dropped these two variables of need factors for further inferential statistical analysis.

For question 1, in order to model the associations between individual level factors on informal caregivers' time spent on caregiving, which separated into three ordinal level: fewer hours of caregiving, medium hours of caregiving, and more hours of caregiving per week at Time 1, we used a weighted ordinal logistic regression model to examine whether both care recipients' and caregivers' predisposing, enabling, and needs factors are associated with time spent on caregiving.

Then, for question two, the relationship between time spent on caregiving and informal

caregivers' physical health, psychological health, and economic well-being were separately examined. The dependent variables, self-rated health (subjective physical health), psychological health, and economic well-being were ordinal and the numbers of chronic illnesses (objective physical health) at Time 2 were continuous, with controlling predisposing, enabling, and need factors of both care recipients and caregivers at Time 1. Therefore, three weighted ordinal logistic regression models and multivariate linear ordinary least squares (OLS) regression models were examined.

Specifically, in order to minimize the selection bias, we used a residualized change model, in which a baseline (in 2008) measure of the dependent variables (physical health, psychological health, and economic well-being) was placed into the model predicting a time 2 measure (in 2010). The baseline measure adjusted for unmeasured factors correlated with the outcomes and time spent on caregiving and reflected in the baseline score. Finally, standardized coefficients were used to determine which variables had the strongest relationships with hours of caregiving.

The core sample in HRS is the nationally-representative and multi-stage area probability sample. However, the HRS design includes three oversamples-- Blacks, Hispanics, and Floridians (residents of the state of Florida). Sample weights (R9WTRESP and R9WTHH) which provided from HRS data sets were used in the following analysis. Because of compensating for the unequal probabilities of selection between the core and oversample domains and generate unbiased estimates of parameters and standard errors for the U.S. population, respondent weights (R9WTRESP) and household weights (R9WTHH) were used in all analyses (Heeringa et al., 2009; Health and Retirement Study, 2004; Health and Retirement Study, 2008). Because the goal of this study is to model/describe the future experiences of the base-year population, rather than modeling/describing the histories of individuals or households

who were in the population in the terminal year (2010), the respondent weight (R9WTRESP) and household weight (R9WTHH) for 2008 of data collection as the base-year weights were recommended and separately used in longitudinal analyses based on the level of the measure of interest (Health and Retirement Study, 2014).

CHAPTER 4

RESULTS

4.1 Determinants of Spouse/Partner Informal Caregiving

Descriptive statistics for the variables used in the analyses are presented first in this chapter. The results of the multivariate hierarchal logistic regressions that examined the effects of predisposing, enabling, and need factors on caregiving hours (three categories: few, medium, and more) are presented next.

4.1.1 Descriptive Statistics

Weighted percentages or means and standard deviations (SD) for the variables are presented in Table 4.1. As indicated in the Table 4.1, informal caregivers spent 33.03 hours per week (almost five hours per day) to take care of their spouse/partner at Time 1. If adopting 20 hours of caregiving per week as the dividing point to sort caregiving into two categories: less than 20 hours per week and more than 20 hours per week, based on the average spent by informal caregivers from the American Association of Retirement Persons (AARP) (2004), 66.02% of caregivers spent less than 20 hours per week and 33.98% spent more than 20 hours per week. If, instead, caregiving hours were separated into three groups: caregiving less (less than 20 hours per week), caregiving medium (between 20 and 56 hours per week), and caregiving more (more than 56 hours per week), we found that 66.02% were providing less caregiving than the average, 17.09% were providing around the same amount, and 16.89% were spending more time.

The predisposing factors, which are similar to social demographics, include age, gender, race/ethnicity, education, employment, presence of living child, and number of people in the

household. The average age of caregivers was 66.19 years old. Slightly over half are female (54.02%) and average education in years was 12.31. The majority of caregivers were non-Hispanic White (85.73%), followed by Black (8.85%), other racial/ethnicity (2.87%), and Hispanic (2.55%). In term of employment status, two thirds still work (66.47%). The sample had 3.35 average living children and had 2.47 people living in their household.

The enabling factors refer to available medical resources and wealth. Available medical resources included health care plans (such as government health-care plan, private long-term care plan), medical and long-term care service utilization (e.g., seeing a doctor, being hospitalized, using nursing home or home care service), and out-of-pocket medical expenses (OOPME) in previous two years from care recipients. The medical utilization and Out of Pocket Medical Expenses of caregivers were also considered. Most care recipients have a government-sponsored health-care plan (77.97%). 71.21% were covered by Medicare and 12.58% were covered by Medicaid. Less than one tenth (8%) of care recipients have purchased private long-term care insurance. Among long-term care related services, 6.97% used nursing home services and nursing home stays averaged 3.11 days. 18.64% utilized home care services. Looking at medical and hospital services, 23.23% have undergone outpatient surgery and 54.93% have had hospital stays, averaging 6.57 days. Care recipients spent an average of $5,589 on out-of-pocket medical expenses, with a range of $ 0 to $ 85,680. As for their caregivers, for long-term care related services, unlike care recipients, less than one percentage of caregivers have ever used nursing home services, (0.78%) with stays averaging 0.42 of a day. Again, among caregivers, 18.64% have used home care services. For medical and hospital services, 16.37% of care recipients have had outpatient surgery and 39.06% have stayed in a hospital (average hospital stay 1.61 days). On average caregivers spent $ 2,516.5 on out-of-pocket medical expenses, with

a range of $ 0 to $ 56,475. The average total household out-of-pocket medical expenses were $8,072.86 with a range of $ 0 to $ 93,930. Regarding usage of long-term care and medical services and incurred out-of-pocket medical expenses, caregivers used less LTC and medical related services and spent less out-of-pocket on medical expenses on average. In addition, the wealth (total assets and income from both care recipient and caregiver) in household level averaged $339,699.09 (median=$81,001.6), with a range of -57,240 to 11,143,669. There were 10 households that their values of wealth were under zero. There are 27.28% in the 25^{th} ~50^{th} quintile, followed by 25.39% above 75^{th} quintile, 23.72% under 25^{th} quintile, and 23.61% in the 50^{th}~75^{th} quintile.

The need factors included the functional impairment of activities of daily living (ADL) and instrument activities of daily living (IADL) affecting both care recipients and caregivers, as well as physical health (self-rated health and chronic illness) and psychological health. Care recipients have 1.61 in ADL scores and 0.35 in IADL scores on average and caregivers' averages were 1.66 in ADL scores and 0.27 in IADL scores. In addition, caregivers who reported their self-rated health as good totaled 32.7%, with 30.81% reporting health status as poor or fair , very good (29.67%); and excellent (6.82%). Furthermore, on average, caregivers reported to have 2.32 items of chronic illness (range from 0~7) and having 1.77 items of psychological problems (range from 0~8). Among caregivers, 38.59% had no psychological problems, followed by those reporting 1~2 psychological problems (34.97%), 3~5 (18.12%), and 8.32 % with 6 or more psychological problems.

Table 4.1 Weighted means (standard deviation) or percentages of the sample (N=496)

Variable	%	M	SD
Dependent variables			
Caregiving hours in 2008 (Time 1)		33.03	48.52
Caregiving less	66.02		
Caregiving medium	17.09		
Caregiving more	16.89		

Table 4.1 (cont.)

Variable	%	M	SD
Independent variables			
Predisposing factors			
Care recipient			
Age		67.94	9.65
< 65	51.78		
>=65	48.22		
Caregiver			
Age			
< 65	51.95		
>=65	48.05		
Gender		66.19	10.57
Male	45.98		
Female	54.02		
Race			
White	85.73		
Black	8.85		
Hispanic	2.55		
Other	2.87		
Education years		12.31	2.93
Employment			
Work	66.47		
Not work	33.53		
Household			
Living child		3.35	2.15
Number of people in household		2.47	1.05
Enabling factors			
Care recipient			
Government health plan	77.97		
Medicare	71.21		
Medicaid	12.58		
Private LTC	8.00		
Nursing home stay	6.97		
Nursing home stay nights		3.11	18.39
Home care	18.64		
Outpatient surgery	23.23		
Hospital surgery	54.93		
Hospital nights		6.57	22.74
Out of pocket medical expenses		5,589.24	9,805.06
Caregiver			
Nursing home stay	0.78		
Nursing home stay nights		0.42	7.48
Home care	4.66		
Outpatient surgery	16.37		
Hospital surgery	39.06		
Hospital nights		1.61	5.30
Out of pocket medical expenses		2,516.50	4,074.85
Household			
Total of out of pocket medical expenses		8,072.86	11,012.84
Wealth (Time 1)		339,699.09	916,592.62
under 25%	23.72		
25%~50%	27.28		

Table 4.1 (cont.)

Variable	%	M	SD
50%~75%	23.61		
Above 75%	25.39		
Need factors			
Care recipient			
ADL		1.61	1.44
IADL		0.35	0.88
Caregiver			
ADL		1.66	1.35
IADL		0.27	0.68
Caregiver			
Physical health			
Self-rated health (Time 1)		2.12	0.93
Poor or fair	30.81		
Good	32.70		
Very good	29.67		
Excellent	6.82		
Chronic illness		2.32	1.52
Psychological problems		1.77	2.12
None	38.59		
1~2	34.97		
3~5	18.12		
6 and more	8.32		

Note: The sample consisted of 496 dyadic data from both care recipient and caregiver as a spouse/partner in the household at both waves of the 2008 and 2010 HRS panel and completed interviews both in 2008 and 2010. All of the predisposing, enabling, and need factors in this Table were in 2008.

4.1.2 Multivariate Results

Results of the hierarchical ordinal logistic regression analysis for caregiving hours per week in 2008 (Time 1) are presented in Table 4.2. The result for Model 1, which consists of only the predisposing factors (social-demographic characteristics), show that caregivers' gender and years of education (marginally) are statistically significantly related to caregiving hours at Time 1. As indicated by the odds ratio, female caregivers have more than two times the caregiving hours per week to spend at Time 1 than do male caregivers (*OR*=1.71; $p<0.05$). Caregivers who are more highly educated are more likely to spend caregiving hours at Time 1 (*OR*=1.07; $p<0.10$) than are those with fewer years in education.

The enabling factors, (health care plan provided by government, private long-term care, hospital stay nights, nursing home nights, outpatient surgery, home care) are included in Model

2, resulting in an improvement of fit over Model 1 (change in likelihood ratio=220,064.923, df=24, p<.0001). Results show that both caregiver's gender (*OR*=1.78; p<0.05) and educational level (*OR*=1.08; p<0.1) remain statistically significant. In addition, the age of caregivers becomes statistically significant (*OR*=2.14; p<0.05). Caregivers who are female and age 65 or older are two times more likely to provide more caregiving hours, compared to caregivers who were male and below 65. Several of the enabling factors, including utilization of home care service (*OR*=0.45; p<0.05) by care recipients, nights of hospital stay (*OR*=1.05; p<0.01) and nights of nursing home (*OR*=1.02; p<0.1), for caregivers and out-of-pocket medical expenses for both (*OR*=1.16; p<0.1) are associated with caregiving hours per week at Time 1. In other words, compared with care recipients who do not use home-care services, care recipients who do use such services, their caregivers are less likely to provide caregiving hours per week at Time 1. Compared to caregivers who have fewer hospital and nursing home stays and lower out-of-pocket medical expenses, caregivers who have more of these factors are more likely to spend more caregiving hours per week at Time 1.

In Model 3, the need factors, which include ADL and IADL in both care recipients and caregivers, are placed in the previous Model 2 (change in likelihood ratio=577,593.666, df=35, p<.0001). Both caregivers' gender and age are no longer statistically significant. Only the age of caregivers (*OR*=2.33; p<0.05) still has a significant association with type of caregiving hours. The employment status of caregivers also becomes significant (*OR*=2.21; p<0.05). Caregivers who are older (65 years and above) and work are two times more likely to provide more hours of caregiving, compared to those who are younger (below 65) and are unemployed. Use of home care services by care recipients and nights of hospital and nursing home stays by caregivers are also not statistically significant. However, caregivers' use of home care services becomes

marginal significant (*OR*=0.31; p<0.1). Caregivers who use home care services are less likely to provide more caregiving hours, compared with those caregivers who do not. As for need factors, compared with care recipients who have fewer functional impairments (lower ADL and IADL scores), care recipients who have higher ADL (*OR*=0.80; p<0.05) and IADL (*OR*=0.56; p<0.001) functional impairments, their caregivers are less like to provide caregiving hours per week at Time 1.

For the research Question one: What are the determinants of couple caregivers' time spent on caregiving?

Hypothesis 1.1 hypothesizes that whether the factors that predict caregiving hours vary by the age of care recipients and the age, gender, race/ethnicity, years of education, and employment status of caregivers as well as the number of children, particularly the number of children living in the home. If only predisposing factors are put into analysis as Model 1, caregivers who are female (significant) and have more education (marginally significant) are more likely to provide longer caregiving hours per week at Time 1, compared to caregivers who are male and less highly educated. When enabling factors (social demography characteristics) were added into Model 1, shown as Model 2, both caregivers' gender and education still remain significant, and age also becomes significant. However, when adding need factors into Model 2 (shown as Model 3), caregivers' gender and education have no significant association with types of caregiving hours, but age still remains significant. In addition, only employment status of caregiver has marginal significant effects on number of caregiving hours provided per week at Time 1.

Hypothesis 1.2 posited that having more family resources and higher income, and utilizing services such as government provided health insurance, private long-term care

insurance, outpatient surgery, hospital and nursing home stays, and home care service, meant that their caregivers are less likely to spend time on caregiving. When considering both predisposing and enabling factors, Model 2 indicates that caregivers are less likely to provide longer caregiving hours per week for care recipients who use home care services, compared to care recipients who do not use more home care services. Besides, caregivers who have more hospital and nursing home stay nights, and with higher spending of out-of-pocket medical expenses from both care recipients and caregivers are more likely to provide longer caregiving hours per week, compared to those caregivers who have fewer hospital and nursing home stay nights, and with fewer out-of-pocket medical expenses from both care recipients and caregivers. However, when need factors are added into Model 2 (shown as Model 3), the prior significant effects disappear; only use of home care services by caregivers becomes a marginally significant association on caregiving hours. The more caregivers use home care service, the less likely they provide longer caregiving hours per week, compared to caregivers who use few home care services.

Hypothesis 1.3: When care recipients have higher ADL and IADL index scores, their caregivers will be less likely to spend more hours. However, if the caregivers and recipients' both have poor health, such as higher ADL and IADL index scores, caregivers are likely to spend less time on caregiving. When need factors are added into Model 3, the care recipients with the higher ADL and IADL index scores, their spouse/partner as caregivers are less likely to provide caregiving hours per week at Time 1, compared to care recipients with less functional impairment. Other need factors from caregivers (self-rated health, chronic illness, psychological problems, and wealth) had no significant association with duration of caregiving hours.

In summary, the final hierarchical multivariate regression model reveals that caregivers

who work and use home care services and care recipients with higher ADL and IADL functional impairments are significantly related to caregiving hours per week at Time 1. Caregivers who do not work and do not use home care services and care recipients who have lower ADL and IADL function impairments, are less likely to provide caregiving hours per week at Time 1.

Table 4.2 Ordinal Logistic Regression Analysis of Caregiving intensity **(N=445)**

Variable	Model 1		Model 2		Model 3	
	B (SE)	***OR* (95% CI)**	**B (SE)**	***OR* (95% CI)**	**B (SE)**	***OR* (95% CI)**
Predisposing factors						
Care recipient						
Age (< 65)						
>=65	-0.39 (0.32)	0.68 (0.36-1.26)	-0.45 (0.38)	0.64 (0.30-1.34)	-0.47 (0.42)	0.62 (0.27-1.42)
Caregiver						
Age (< 65)						
>=65	0.33 (0.33)	1.39 (0.73-2.37)	**0.76*** (0.35)	2.14 (1.08-4.25)	**0.84*** (0.40)	2.33 (1.07-5.06)
Race (White)						
Black	-0.37 (0.36)	0.69 (0.34-1.39)	-0.20 (0.36)	0.82 (0.41-1.65)	-0.14 (0.43)	0.87 (0.38-2.01)
Hispanic	0.36 (0.80)	1.43 (0.30-6.80)	0.57 (0.67)	1.78 (0.48-6.61)	0.85 (0.83)	2.31 (0.46-11.71)
Other	0.75 (0.97)	2.11 (0.31-14.23)	0.82 (0.81)	2.28 (0.46-11.25)	0.69 (0.74)	1.95 (0.46-8.34)
Gender (Male)						
Female	**0.53*** (0.26)	1.71 (1.03-2.83)	**0.58*** (0.27)	1.78 (1.05-3.01)	0.37 (0.30)	1.44 (0.81-2.56)
Education years	**0.07+** (0.04)	1.07 (0.99-1.52)	**0.07+** (0.04)	1.08 (0.99-1.17)	0.05 (0.05)	1.05 (0.95-1.16)
Employment (Not work)						
Work	0.42 (0.30)	1.52 (0.84-2.76)	0.46 (0.32)	1.58 (0.85-2.96)	**0.79*** (0.37)	2.21 (1.07-4.57)
Household						
Living child	-0.02 (0.05)	0.98 (0.29-1.08)	-0.03 (0.06)	0.97 (0.87-1.09)	-0.03 (0.06)	0.97 (0.86-1.09)
Number of people in household	-0.07 (0.10)	0.93 (0.16-1.14)	-0.09 (0.11)	0.91 (0.73-1.14)	-0.07 (0.13)	0.94 (0.73-1.20)
Enabling factors						
Care recipient						
Health plan by government			-0.49 (0.46)	0.61 (0.25-1.50)	-0.56 (0.50)	0.57 (0.21-1.54)
Private LTC			0.58	1.78	0.66	1.94

Table 4.2 (cont.)

Variable	Model 1		Model 2		Model 3	
	B (SE)	*OR* (95% CI)	B (SE)	*OR* (95% CI)	B (SE)	*OR* (95% CI)
			(0.58)	(0.58-5.49)	(0.53)	(0.69-5.49)
Hospital stay nights			0.00	1.00	0.00	1.00
			(0.01)	(0.98-1.01)	(0.01)	(0.99-1.01)
Nursing home nights			0.00	1.00	0.00	1.00
			(0.01)	(0.99-1.01)	(0.01)	(0.99-1.01)
Outpatient surgery			0.44	1.56	0.59	1.81
			(0.32)	(0.84-2.90)	(0.37)	(0.88-3.72)
Home care			-0.83+	0.44	-0.40	0.67
			(0.32)	(0.24-0.81)	(0.33)	(0.35-1.29)
Caregiver						
Hospital stay nights			0.05**	1.05	0.04	1.04
			(0.03)	(0.99-1.11)	(0.04)	(0.97-1.12)
Nursing home nights			0.02+	1.02	0.02	1.02
			(0.01)	(1.00-1.04)	(0.01)	(1.00-1.04)
Outpatient surgery			-0.07	0.93	-0.20	0.82
			(0.33)	(0.49-1.77)	(0.36)	(0.41-1.65)
Home care			-0.76	0.47	-1.18+	0.31
			(0.49)	(0.18-1.23)	(0.64)	(0.09-1.08)
Household						
Out-of-Pocket Medical Expenses			0.14+	1.16	0.13	1.14
			(0.09)	(0.98-1.37)	(0.10)	(0.94-1.38)
Wealth in 2010 (above 75 quintile)						
under 25%			0.43	1.53	0.36	1.43
			(0.44)	(0.98-1.37)	(0.47)	(0.57-3.59)
25%~50%			0.37	1.45	-0.01	1.00
			(0.41)	(0.65-3.25)	(0.42)	(0.44-2.25)
50%~75%			0.17	1.19	0.16	1.18
			(0.39)	(0.55-2.56)	(0.39)	(0.55-2.51)
Need factors						
Care recipient						
ADL					-0.26**	0.77
					(0.10)	(0.64-0.93)
IADL					-0.60***	0.55
					(0.10)	(0.45-0.68)
Caregiver						
ADL					0.30	1.35
					(0.20)	(0.90-2.01)
IADL					0.27	1.31
					(0.20)	(0.88-1.93)
Self-rated health at Time 1(Excellent)						
poor and fair					-0.01	0.99
					(0.59)	(0.31-3.13)
Good					0.46	1.58
					(0.54)	(0.55-4.53)
Very good					-0.38	0.68
					(0.53)	(0.24-1.93)
Chronic illness in					0.06	1.06

Table 4.2 (cont.)

Variable	Model 1		Model 2		Model 3	
	B (SE)	***OR* (95% CI)**	**B (SE)**	***OR* (95% CI)**	**B (SE)**	***OR* (95% CI)**
2008 Psychological problems (6 and more)					(0.11)	(0.86-1.31)
none					0.01 (0.59)	1.01 (0.32-3.22)
1~2					-0.36 (0.53)	0.70 (0.25-1.97)
3~5					-0.20 (0.58)	0.82 (0.26-2.54)
Intercept 1	-0.26 (0.67)		-1.54 (1.06)		0.21 (1.22)	
Intercept 2	0.71 (0.67)		-0.47 (1.05)		1.48 (1.21)	
Likelihood Ratio	χ^2(df =10) = 85,384.8443 $p < .0001$		χ^2(df =24) = 220,064.923 $p < .0001$		χ^2(df =35) = 577,593.666 $p < .0001$	

Note: The sample consisted of 445 dyadic data from both care recipient and caregiver as a spouse/partner in the household at both waves of the 2008 and 2010 HRS panel and completed interviews both in 2008 and 2010. References categories are in parentheses.
+ $p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

4.2 Impacts of Caregiving on Informal Caregivers' Well-Being

I present descriptive statistics for the variables used in the analyses in this section. The results of the ordinal logistic regression and multivariate ordinal least square (OLS) regression models that examined the effects of caregiving hours at Time 1 on caregivers' physical health (self-rated health and chronic illness), psychological health, and economic well-being at Time 2 with controlling predisposing, enabling, and need factors at Time 1are presented next.

4.2.1 Descriptive Statistics

Weighted percentages or means and stand deviations (SD) for the variables are presented in Table 4.3. The results indicate that, in 2010, nearly 33.5% of the caregivers reported their self-rated health (subjective physical health) as poor or fair, followed by those reporting good (32.75%) and very good (27.1%); only 6.66% reported an excellent health status. Caregivers

averaged 2.66 chronic illness (range from 0~7) and their psychological scores averaged 1.84 (range from 0~8) at Time 2. The higher scores in both categories reflect worse physical and psychological health. About 33% of the caregivers have no psychological problems, followed by36% reporting 1~2 psychological problems), and those reporting 3~5 psychological problems (16.52%); only 9.29 % have 6 and more psychological problems. The average household wealth was $344,985.93 (median=$76,053), with a range of $-136,455 to $10,142,200, including assets and income from both care recipients and caregivers. There were 13 households that had negative values of wealth. Other characteristics of control variables were discussed in the prior section.

Compared to caregivers' physical and psychological health and wealth in 2010, in 2008 nearly 32.7% of the caregivers reported their self-rated health (subjective physical health) as good, followed by those reporting poor or fair (30.81%) and very good (29.67%); only 6.82% reported an excellent health status. Caregivers averaged 2.32 chronic illness (range from 0~7) and their psychological problems scores were 1.77 (range from 0~8) at Time 1. Near 36.1% of the caregivers reported no psychological problems, with37.36% reporting 1~2 psychological problems, and 17.72% reporting 3~5 psychological problems; only 8.85 % have 6 or more psychological problems. The household wealth of dyads averaged $339,699.09 (median=$81,001.6), with a range of $-57,240 to $11,143,669. In sum, caregivers have greater financial assets and poorer physical and psychological health and at Time 2, compared to Time 1.

Table 4.3 Weighted means (standard deviation) or percentages of the sample (N=496)

Variable	%	M	SD
Dependent variables at Time 2			
Caregiver			
Physical health			
Self-rated health (Time 2)		3.92	0.96
Poor or fair	33.50		
Good	32.75		
Very good	27.10		

Table 4.3 (cont.)

Variable	%	M	SD
Excellent	6.65		
Chronic illness (Time 2)		2.66	1.61
Psychological health (Time 2)		1.84	2.08
None	36.07		
1~2	37.36		
3~5	17.72		
6 and more	8.85		
Wealth (Time 2)		344,985.93	924,322.63
under 25%	21.90		
25%~50%	28.06		
50%~75%	23.90		
Above 75%	26.14		
Independent variables at Time 1			
Caregiver			
Caregiving fewer	66.02		
Caregiving medium	17.09		
Caregiving more	16.89		
Control Variables at Time 1			
Predisposing factors			
Care recipient			
Age		67.94	9.65
< 65	51.78		
>=65	48.22		
Caregiver			
Age			
< 65	51.95		
>=65	48.05		
Gender		66.19	10.57
Male	45.98		
Female	54.02		
Race			
White	85.73		
Black	8.85		
Hispanic	2.55		
Other	2.87		
Education years		12.31	2.93
Employment			
Work	66.47		
Not work	33.53		
Household			
Living child		3.35	2.15
Number of people in household		2.47	1.05
Enabling factors			
Care recipient			
Government health plan	77.97		
Private LTC	8.00		
Hospital nights		6.57	22.74
Nursing home stay nights		3.11	18.39
Outpatient surgery	23.23		
Home care	18.64		
Caregiver			
Hospital nights		1.61	5.30

Table 4.3 (cont.)

Variable	%	M	SD
Nursing home stay nights		0.42	7.48
Outpatient surgery	16.37		
Home care	4.66		
Household			
Total of out of pocket medical expenses		8,072.86	11,012.84
Wealth (Time 1)		339,699.09	916,592.62
under 25 ^{tn}	23.72		
25 ^{tn} ~50 ^{tn}	27.28		
50 ^{tn} ~75 ^{tn}	23.61		
Above 75^{tn}	25.39		
Need factors			
Care recipient			
ADL		1.61	1.44
IADL		0.35	0.88
Caregiver			
ADL		1.66	1.35
IADL		0.27	0.68
Caregiver			
Physical health (Time 1)			
Self-rated health		2.12	0.93
Poor or fair	30.81		
Good	32.70		
Very good	29.67		
Excellent	6.82		
Chronic illness		2.32	1.52
Psychological problems (Time 1)		1.77	2.12
None	38.59		
1~2	34.97		
3~5	18.12		
6 and more	8.32		

Note: The sample consisted of 496 dyadic data from both care recipient and caregiver as a spouse/partner in the household at both waves of the 2008 and 2010 HRS panel and completed interviews both in 2008 and 2010.

4.2.2 Multivariate Results (Self-Rated Health as Subjective Physical Health)

Self-Rated Health. Table 4.4 shows the multivariate results of ordinal logistic regression examining the relations between providing medium hours of caregiving and more hours of caregiving, compared with providing fewer hours of caregiving, and caregivers' self-rated health. The results indicate that both medium hours of caregiving and more hours of caregiving at Time 1were not significantly associated with the self-rated health status of caregivers at Time 2. Table 4.4 also indicates caregiver who were 65 or older (OR=0.39, p<.05) were two times more likely to report a higher level of self-rated health status, compared with those who were younger than 65. The remainder of the predisposing factors, care recipients' age, caregivers' gender,

race/ethnicity, employment, education, and living child and number of people in a household level, were not statistically significantly associated with self-rated health status of those caregivers.

In addition, none of the enabling factors of care recipients and caregivers were found to be significantly associated with self-rated health status of those caregivers.

I also found that other need factors were significantly associated with the self-rated health of caregivers. Specifically, comparing those care recipients who reported higher ADL and caregivers who reported lower IADL scores, with care recipients who reported lower ADL (*OR*=0.83, *p*<.05) and caregivers who reported lower IADL scores (*OR*=0.57, *p*<.05) they were less likely to report a higher level of self-rated health. Similarly, care recipients who reported higher IADL scores (*OR*=1.24, *p*<.05) were more likely to report a higher level of self-rated health, compared with those care recipients who reported lower IADL scores. Furthermore, caregivers with higher level of chronic illness (*OR*=0.77 *p*<.001) were less likely to report a higher level of self-rated health, compared with caregivers with lower levels of chronic illness. Caregivers with 1~2 psychological problems (*OR*=0.48 *p*<.1) are less likely to report a higher level of self-rated health, compared to caregivers with more than 6 psychological problems.

In the multivariate analysis, in order to minimize the potential selection bias, a previous measure of self-rated health at Time 1 was controlled. I found that caregivers who reported poor and fair health (*OR*=0.01, *p*<.001) and good health (*OR*=0.03, *p*<.001) and very good health (*OR*=0.09, *p*<.001) in 2008 were less likely to report a higher level of self-rated health in 2010, compared to those who reported excellent in 2008. The Likelihood Ratio (x^2(*df*= 37) =1,409,945.24, *p*<.0001) indicated a highly statistically significant model fit.

Table 4.4 Ordinal Logistic Regression Analysis of Self-Rated Health at Time 2 **(N=429)**

Variable	B	Standard Error	OR (95% CI)
Independent variables at Time 1			
Caregiver (Caregiving fewer)			
Caregiving medium	0.35	0.38	1.42 (0.68-2.98)
Caregiving more	0.51	0.34	1.67 (0.86-3.22)
Control Variables at Time 1			
Predisposing factors			
Care recipient			
Age (< 65)			
>=65	-0.46	0.42	0.63 (0.28-1.43)
Caregiver (< 65)			
Age			
>=65	**1.00***	0.39	2.73 (1.27-5.87)
Gender (Male)			
Female	0.26	0.26	1.29 (0.78-2.14)
Race (White)			
Black	0.32	0.46	1.38 (0.56-3.40)
Hispanic	0.78	0.90	2.18 (0.38-12.65)
Other	-0.35	0.84	0.70 (0.13-3.66)
Education years	0.05	0.04	1.05 (0.96-1.15)
Employment (Not work)			
Work	-0.15	0.28	0.86 (0.50-1.48)
Household			
Living child	0.00	0.06	1.00 (0.88-1.14)
Number of people in household	-0.05	0.12	0.96 (0.75-1.21)
Enabling factors			
Care recipient			
Government health plan	0.26	0.44	1.30 (0.55-3.06)
Private LTC	0.04	0.43	1.04 (0.45-2.41)
Hospital nights	0.00	0.01	1.01 (0.99-1.02)
Nursing home stay nights	0.01	0.00	1.01 (1.00-1.01)
Outpatient surgery	-0.17	0.32	0.84 (0.45-1.59)
Home care	-0.51	0.34	0.60 (0.31-1.16)
Caregiver			
Hospital nights	-0.07	0.05	0.93 (0.85-1.03)
Nursing home stay nights	-0.28	0.78	0.76 (0.16-3.52)
Outpatient surgery	0.42	0.29	1.52 (0.86-2.67)
Home care	1.21	0.81	3.34 (0.68-16.36)
Household			
Total of out of pocket medical expenses	0.03	0.09	1.03 (0.87-1.23)
Wealth in 2010 (above 75 th quintile)			

Table 4.4 (cont.)

Variable	B	Standard Error	OR (95% CI)
under 25 th	-0.77	0.47	0.46 (0.19-1.17)
25 th ~50 th	0.21	0.42	1.24 (0.55-2.81)
50 th ~75 th	-0.08	0.34	0.92 (0.47-1.78)
Need factors			
Care recipient			
ADL	**-0.18***	0.09	0.83 (0.70-0.99)
IADL	**0.22***	0.10	1. 24 (1.02-1.52)
Caregiver			
ADL	0.09	0.30	1.09 (0.61-1.94)
IADL	**-0.56+**	0.30	0.57 (0.32-1.04)
Self-rated health (Excellent)			
Poor and fair	**-5.28*****	0.69	0.01 (0.00-0.02)
Good	**-.3.65*****	0.58	0.03 (0.01-0.08)
Very good	**-2.38*****	0.58	0.09 (0.03-0.29)
Chronic illness	**-0.27****	0.10	0.77 (0.63-0.93)
Psychological problems (6 and more)			
none	-0.24	0.45	0.79 (0.32-1.91)
1~2	**-0.73+**	0.44	0.48 (0.20-1.15)
3~5	-0.72	0.52	1.49 (0.17-1.36)
Intercept 4	-0.85	1.14	
Intercept 3	2.16	1.11	
Intercept 2	4.61	1.11	
Likelihood Ratio	χ^2(df =37) = 1,409,945.24 $p < .0001$		

Note: The sample consisted of 429 dyadic data from both care recipient and caregiver as a spouse/partner in the household at both waves of the 2008 and 2010 HRS panel and completed interviews both in 2008 and 2010. References categories are in parentheses.
+ $p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

4.2.3 Multivariate Results (Chronic Illness as Objective Physical Health)

Chronic Illness. Table 4.5 shows the multivariate results of ordinal least square (OLS) regression examining the relations between providing medium or more hours of caregiving, compared with providing fewer hours of caregiving, and caregivers' chronic illness. The results indicate that providing more hours of caregiving at Time 1 were marginally and positively significantly associated with the number of chronic illnesses of caregivers (B=0.16, p<0.1) at Time 2. However, providing medium hours of caregiving was not significantly associated with caregivers' number of chronic illnesses. From Table 4.5, a number of disposing factors, including

caregivers' age, gender, race/ethnicity, and employment, demonstrate significant negative relationships with the numbers of chronic illnesses of caregivers. Those caregivers who were 65 or older (B= -0.16, p<0.1), female (B= -0.15, p<0.05), and work (B= -0.19, p<0.01) at Time 1 were less likely to report a higher number of chronic illnesses, compared to those who were younger than 65, male, and unemployed. In addition, caregivers with other race/ethnicity (B= 0.74, p<0.001) were significantly more likely to report higher number of chronic illnesses, compared to the caregivers who were White, Black, and Hispanic. The remainder of the predisposing factors, including care recipients' age, caregivers' education, presence of children and number of people in a household, were not statistically significantly associated with the number of chronic illness of these caregivers.

Enabling factors of care recipients with government-provided health plan (B= 0.24, p<0.01), more stay nights in hospital (B= 0.01, p<0.001) were found to be significantly associated with a higher number of chronic illness among their caregivers, compared with care recipients without a government provided health plan, and fewer stay nights in hospitals and nursing homes. However, care recipients who had more stay nights in nursing homes (B= -0.003, p<0.1) were less likely (marginally significant) to have a higher number of chronic illnesses, compared with those who have fewer stay nights in nursing homes.

In addition, caregivers who had outpatient surgery were found to have a marginally significant association with caregivers' number of chronic illnesses. Caregivers who had outpatient surgery were more likely (B= -0.14, p<0.1) to report lower numbers of chronic illness, compared with those care recipients without outpatient surgery.

I also found that two need factors (care recipients' IADL and caregivers' number of chronic illnesses at Time 1) were significantly associated with the number of chronic illnesses of

caregivers at Time 2. Specifically, compared to those care recipients who reported lower IADL, caregivers who reported higher IADL (*B*= 0.22, *p*<0.1) were less likely to report a higher number of chronic illnesses. In the multivariate analysis, in order to minimize the potential selection bias, a previous measure of numbers of chronic illness at Time 1 was controlled. Caregivers' who reported a higher number of chronic illnesses at Time 1 were more likely to report a higher number of chronic illnesses at Time 2 (*B*= 0.95, *p*<0.001). The F statistic indicated a highly statistically significant model fit (Adjusted R^2=0.87, *F*=80. 41, p<.0001).

Testing of the possibility of multicollinearity among different independent and control variables, the variance inflation factors (VIF) are assessed, which showed that none were greater than 3 (ranged between 1.06 and 2.7). This suggests that the covariates are not highly correlated with the predictors (three types of caregiving hours: fewer, medium, and more) and multicollinearity may not be a concern.

Table 4.5 Multivariate Regression Analysis of Chronic Illness at Time 2 **(N=429)**

Variable	**B**		**SE**
Independent variables at Time 1			
Caregiver (Caregiving fewer)			
Caregiving medium	0.08		0.08
Caregiving more	**0.16**	+	0.09
Control Variables at Time 1			
Predisposing factors			
Care recipient			
Age (< 65)			
>=65	0.02		0.09
Caregiver (< 65)			
Age			
>=65	**-0.16**	+	0.09
Gender (Male)			
Female	**-0.15**	*	0.06
Race (White)			
Black	0.01		0.11
Hispanic	0.03		0.19
Other	**0.74**	***	0.18
Education years	0.00		0.01

Table 4.5 (cont.)

Variable	B		SE
Employment (Not work)			
Work	**-0.19**	**	0.07
Household			
Living child	0.00		0.01
Number of people in household	-0.03		0.03
Enabling factors			
Care recipient			
Government health plan	**0.24**	**	0.08
Private LTC	0.04		0.11
Hospital nights	**0.01**	***	0.00
Nursing home stay nights	**-0.003**	+	0.00
Outpatient surgery	-0.02		0.07
Home care	-0.02		0.08
Caregiver			
Hospital nights	0.00		0.01
Nursing home stay nights	0.01		0.00
Outpatient surgery	**-0.14**	+	0.08
Home care	-0.04		0.15
Household			
Total of out of pocket medical expenses	0. 01		0.02
Wealth (above 75 th quintile)			
under 25 th	-0.04		0.10
25 th ~50 th	0.03		0.09
50 th ~75 th	0.10		0.08
Need factors			
Care recipient			
ADL	0.00		0.02
IADL	**-0.05**	+	0.02
Caregiver			
ADL	-0.03		0.04
IADL	0.00		0.05
Self-rated health (Excellent)			
Poor and fair	0.09		0.14
Good	0.10		0.12
Very good	-0.03		0.12
Chronic illness	**0.95**	***	0.02
Psychological problems (6 and more)			
none	-0.13		0.11
1~2	0.00		0.10
3~5	0.08		0.12
Intercept	0.62		0.28
Model Statistics	Adj R-Square=0.87, F=80.41, p<0.0001		

Note: The sample consisted of 429 dyadic data from both care recipient and caregiver as a

spouse/partner in the household at both waves of the 2008 and 2010 HRS panel and completed interviews both in 2008 and 2010. References categories are in parentheses. R-Square=0.88

+ $p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

4.2.4 Multivariate Results (Psychological Health)

Psychological Health. Table 4.6 shows the multivariate results of ordinal logistic regression examining the relations between measures of providing medium or more hours of caregiving at Time 1, compared with providing fewer hours of caregiving, and caregivers' psychological health at Time 2. The results indicate that both provision of medium hours of caregiving and more hours of caregiving were not significantly associated with the self-rated health status of caregivers. Table 4.6 also indicates that employed caregivers (*OR*=0.5, *p*<.01) were less likely to report higher levels of psychological problems, compared to the unemployed The remainder of the predisposing factors, care recipients' and care providers' ages, caregivers' gender, race/ethnicity, education, and presence of children and number of people in household, were not statistically significantly associated with caregivers' psychological health.

Care givers outpatient surgery was found to be significantly associated with psychological health. Caregivers who experienced outpatient surgery (*OR*=0.39, *p*<.01) were less likely to report a higher level of psychological problems, compared with those caregivers who did not have outpatient surgery.

I also found that three need factors were significantly associated with the numbers of psychological problems from caregivers. Specifically, compared to those care recipients who reported lower ADL scores, care recipients who reported higher ADL scores (*OR*=1.28, *p*<.01) were more likely to report a higher number of psychological problems. Furthermore, caregivers who reported their health status as poor or fair (at Time 1) were nearly three times (*OR*=2.66, *p*<.1) more likely to report a higher level of psychological problems, compared with those who

reported their health status as good, very good, or excellent..

In the multivariate analysis, in order to minimize the potential selection bias, a previous measure of psychological problems at Time 1 was controlled. I found that caregivers who reported no items of psychological problems (*OR*=0.03, *p*<.001) and 1~2items of psychological problems (*OR*=0.13, *p*<.001) and 3~5 items of psychological problems (*OR*=0.3, *p*<.001) in 2008 were less likely to report a higher level of psychological problems in 2010, compared to those who reported 6 or more psychological problems in 2008. The Likelihood Ratio (x^2(*df*= 30) =1,061,067.07, *p*<.0001) indicated a highly statistically significant model fit.

Table 4.6 Ordinal Logistic Regression Analysis of Psychological Health at Time 2 **(N=415)**

Variable	B	Standard Error	OR (95% CI)
Independent variables at Time 1			
Caregiver (Caregiving fewer)			
Caregiving medium	0.06	0.31	1.06 (0.57-1.97)
Caregiving more	0.01	0.34	1.01 (0.52-1.96)
Control Variables at Time 1			
Predisposing factors			
Care recipient			
Age (< 65)			
>=65	0.35	0.43	1.41 (0.61-3.30)
Caregiver (< 65)			
Age			
>=65	-0.54	0.40	0.58 (0.27-1.29)
Gender (Male)			
Female	0.29	0.27	1.34 (0.79-2.26)
Race (White)			
Black	-0.08	0.41	0.93 (0.42-2.05)
Hispanic	-0.51	0.68	0.60 (0.16-2.30)
Other	0.14	0.88	1.15 (0.20-6.46)
Education years	0.05	0.04	1.05 (0.96-1.15)
Employment (Not work)			
Work	**-0.70***	0.34	0.50 (0.26-0.97)
Household			
Living child	-0.04	0.06	0.96 (0.85-1.08)
Number of people in household	-0.11	0.14	0.90 (0.69-1.18)
Enabling factors			
Care recipient			

Table 4.6 (cont.)

Variable	B	Standard Error	OR (95% CI)
Government health plan	0.15	0.38	1.16 (0.55-2.45)
Private LTC	-0.33	0.41	0.72 (0.32-1.59)
Hospital nights	0.00	0.00	1.00 (0.99-1.01)
Nursing home stay nights	-0.01	0.01	1.00 (0.98-1.01)
Outpatient surgery	0.05	0.31	1.05 (0.57-1.94)
Home care	-0.50	0.34	0.61 (0.31-1.17)
Caregiver			
Hospital nights	0.00	0.02	1.00 (0.95-1.04)
Nursing home stay nights	0.02	0.01	1.02 (1.00-1.04)
Outpatient surgery	**-0.94****	0.32	0.39 (0.21-0.72)
Home care	-0.03	0.54	0.97 (0.34-2.79)
Household			
Total of out of pocket medical expenses	-0.04	0.08	0.96 (0.82-1.13)
Wealth (above 75 th quintile)			
under 25 th	0.06	0.42	1.07 (0.47-2.43)
25 th ~50 th	-0.60	0.37	0.55 (0.27-1.15)
50 th ~75 th	-0.52	0.35	0.60 (0.30-1.18)
Need factors			
Care recipient			
ADL	**0.25****	0.09	1.28 (1.07-1.53)
IADL	0.09	0.10	1.09 (0.90-1.33)
Caregiver			
ADL	0.00	0.17	1.00 (0.71-1.40)
IADL	0.06	0.22	1.06 (0.69-1.63)
Self-rated health (Excellent)			
Poor and fair	**0.98+**	0.59	2.66 (0.84-8.49)
Good	0.28	0.54	1.32 (0.46-3.77)
Very good	-0.39	0.51	0.67 (0.25-1.83)
Chronic illness	0.00	0.10	1.00 (0.83-1.21)
Psychological problems (6 and more)			
none	**-3.68*****	0.63	0.03 (0.01-0.09)
1~2	**-2.01*****	0.59	0.13 (0.04-0.42)
3~5	**-1.20*****	0.61	0.30 (0.09-0.99)
Intercept 4	-1.09	1.28	
Intercept 3	0.79	1.34	
Intercept 2	3.32	1.36	
Likelihood Ratio	χ^2(df =37) = 1,061,067.07 p < .0001		

Note: The sample consisted of 415 dyadic data from both care recipient and caregiver as a spouse/partner in the household at both waves of the 2008 and 2010 HRS panel and completed interviews both in 2008 and 2010. References categories are in parentheses.
+ p < .10; *p < .05; **p < .01; ***p < .001

4.2.5 Multivariate Results (Wealth as Economic Well-Being)

Wealth. Table 4.7 shows the multivariate results of ordinal logistic regression examining the relations between measures of providing medium hours of caregiving and more hours of caregiving at Time 1, compared with providing fewer hours of caregiving, and caregivers' household wealth. The results indicate that neither providing medium hours of caregiving nor more hours of caregiving were significantly associated with the caregivers' household wealth at Time 2. The current study also examined the impacts of the length of caregiving hours on total household income and household asset separately and also did not find the significant association. Table 4.7 also indicates the caregivers with higher education (OR=1.17, p<.001) were more likely to report higher levels of wealth, compared with those with lower education. The remainder of the predisposing factors, care recipients' age, caregivers' age, gender, race/ethnicity, employment, presence of children and number of people in a household l, were not statistically significantly associated with caregivers' psychological problems.

Enabling factors of care recipients' private long-term care insurance and caregivers' stay nights in nursing home were all found to be significantly associated with a higher level of wealth. Care recipient who had private long-term care insurance (OR=3.53, p<.01) were 3.5 times more likely to report a higher level of household wealth, compared with care recipients without private long-term care insurance. In addition, caregivers who had more stay nights in nursing homes (OR=0.97, p<.1) were less likely to report a higher level of household wealth, compared with care recipients who used fewer stay nights in nursing homes.

No need factors were found significantly associated with the level of wealth. In the multivariate analysis, in order to minimize the potential selection bias, a previous measure of household wealth at Time 1 was controlled. I found that caregivers who reported below the 25th

quintile of wealth (*OR*=0.01, *p*<.001) and between the 25th ~50thquintile of wealth (*OR*=0.03, *p*<.001) and between the 50th~75th quintile of wealth (*OR*=0.15, *p*<.001) in 2008 were less likely to report a higher level of wealth in 2010, compared to those who are in the above the 75th quintile of wealth in 2008. The Likelihood Ratio (x^2(*df*= 37) =1,947,146.7, *p*<.0001) indicated a highly statistically significant model fit.

Table 4.7 Ordinal Logistic Regression Analysis of Wealth at Time 2 **(N=469)**

Variable	B	Standard Error	OR (95% CI)
Independent variables at Time 1			
Caregiver (Caregiving fewer)			
Caregiving medium	-0.26	0.31	0.77 (0.42-1.40)
Caregiving more	-0.09	0.37	0.91 (0.45-1.87)
Control Variables at Time 1			
Predisposing factors			
Care recipient			
Age (< 65)			
>=65	-0.16	0.39	0.85 (0.40-1.85)
Caregiver (< 65)			
Age			
>=65	0.55+	0.38	1.73 (0.83-3.66)
Gender (Male)			
Female	-0.20	0.25	0.82 (0.50-1.35)
Race (White)			
Black	-0.04	0.40	0.96 (0.44-2.09)
Hispanic	-1.57	1.17	0.21 (0.02-2.05)
Other	-0.44	0.81	0.65 (0.13-3.14)
Education years	**0.16*** **	0.25	1.17 (1.07-1.27)
Employment (Not work)			
Work	0.41	0.30	1.51 (0.84-2.70)
Household			
Living child	-0.05	0.06	0.95 (0.85-1.06)
Number of people in household	0.14	0.12	1.15 (0.90-1.47)
Enabling factors			
Care recipient			
Government health plan	0.17	0.36	1.18 (0.58-2.41)
Private LTC	**1.26** **	0.43	3.53 (1.51-8.28)
Hospital nights	-0.01	0.01	0.99 (0.98-1.00)
Nursing home stay nights	0.00	0.00	1.00 (0.99-1.00)
Outpatient surgery	0.43	0.29	1.54 (0.87-2.73)
Home care	0.07	0.30	1.07 (0.59-1.94)

Table 4.7 (cont.)

Variable	B	Standard Error	OR (95% CI)
Caregiver			
Hospital nights	0.01	0.03	1.01 (0.95-1.07)
Nursing home stay nights	**-0.03****	0.01	0.97 (0.94-0.99)
Outpatient surgery	0.32	0.32	1.38 (0.74-2.60)
Home care	-0.72	0.68	0.55 (0.15-1.98)
Household			
Total of out of pocket medical expenses	0.08	0.08	1.11 (0.95-1.29)
Wealth (above 75 th quintile)			
under 25 th	**-5.29*****	0.56	0.01 (0.00-0.02)
25 th ~50 th	**-3.51*****	0.44	0.03 (0.01-0.07)
50 th ~75 th	**-1.90*****	0.40	0.15 (0.07-0.33)
Need factors			
Care recipient			
ADL	-0.09	0.09	0.91 (0.76-1.09)
IADL	-0.05	0.10	0.95 (0.78-1.15)
Caregiver			
ADL	-0.15	0.17	0.86 (0.61-1.21)
IADL	0.24	0.21	1.28 (0.84-1.93)
Self-rated health (Excellent)			
Poor and fair	-0.62	0.59	0.54 (0.17-1.71)
Good	-0.58	0.55	0.56 (0.19-1.65)
Very good	-0.16	0.54	0.85 (0.29-2.46)
Chronic illness	0.08	0.10	1.09 (0.89-1.32)
Psychological problems (6 and more)			
none	-0.04	0.47	0.97 (0.38-2.42)
1~2	0.25	0.44	1.29 (0.54-3.05)
3~5	0.43	0.48	1.53 (0.61-3.89)
Intercept 1	-2.33	1.14	
Intercept 2	-0.10	1.15	
Intercept 3	2.44	1.15	
Likelihood Ratio	χ^2(df =37) = 1,947,146.70 $p < .0001$		

Note: The sample consisted of 469 dyadic data from both care recipient and caregiver as a spouse/partner in the household at both waves of the 2008 and 2010 HRS panel and completed interviews both in 2008 and 2010. References categories are in parentheses.
+ $p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

For the research Question two: What are the impacts of caregiving hours (Time 1) on informal caregivers' physical health, psychological health, and economic well-being (Time 2) when controlling both care recipients' and caregivers' predisposing, enabling, and need

factors (Time 1)?

Hypothesis 2.1 hypothesized that more caregiving hours at Time 1 would be strongly associated with poorer caregivers' self-rated health at Time 2. Providing medium and more caregiving hours (Time 1) has no significant associations with caregivers' self-rated health, (Time 2) when controlling predisposing, enabling, and need factors of both care recipients and caregivers (Time).

Hypothesis 2.2 postulated that more time spent on caregiving at Time 1 would be strongly associated with a larger negative effect on the caregivers' chronic illness as objective physical health at Time 2. Providing median hours of caregiving (Time 1) has no association with the number of chronic illnesses of caregivers (Time 2). However, providing more **c**aregiving hours (Time 1) is marginally positively significant correlated with caregivers' number of chronic illnesses, (Time 2) when controlling predisposing, enabling, and need factors of both care recipients and caregivers (Time 1).

Hypothesis 2.3 postulated that more time spent on caregiving by caregivers at Time 1 would be strongly associated with a larger negative effect on the caregivers' psychological health at Time 2. Providing medium hours and more caregiving hours at Time 1 has no significant association with caregivers' psychological health at Time 2 when controlling predisposing, enabling, and need factors of both care recipients and caregivers at Time 1.

Hypothesis 2.4 postulated that more time spent on caregiving at Time 1 would be strongly associated with a larger negative effect on the caregivers' economic well-being (wealth in household level) at Time 2. Providing medium hours and more caregiving hours by caregivers (Time 1) had no significant associations with caregivers' household wealth (Time 2) when controlling predisposing, enabling, and need factors of both care recipients and caregivers

(Time 1).

In summary, the separated ordinal logistic regression model and multivariate OLS regression model reveal mixed findings regarding the impacts of caregiving hours at Time 1 on caregivers' physical and psychological health, and economic well-being at Time 2 when controlling other characteristics (predisposing, enabling, and need factors) of both care recipients and caregivers at Time 1.

4.3 Summary of Results

When the results are put together, they show mixed support for the study hypotheses. Table 4.8 indicates these summarized findings. Hypotheses 1.1, 1.2, 1.3, and 2.2 are partly supported, since caregivers who were younger, unemployed, used home care services, and care recipients with higher ADL and IADL functional impairments, are less likely to provide a higher level of caregiving hours per week. In addition, caregivers who provided more **c**aregiving hours at Time 1 are marginally, positively significantly correlated with caregivers' higher number of chronic illnesses at Time 2.

By contrast, Hypotheses 1.1, 2.1, 2.3, and 2.4 are not supported. Caregivers who worked are more likely to provide more caregiving hours per week. In addition, providing more caregiving hours per week at Time 1 is not significantly correlated with caregivers' self-rated health, psychological problems, or caregivers' household wealth at Time 2.

Table 4.8 Summary of findings, by hypothesis

Hypothesis	**Relationship Tested**	**Finding**
Research Question 1 **What are the determinants of couple caregivers' time spent on caregiving?**		
1.1	If care recipients are younger, and caregivers are older, female, members of a racial/ethnic minority,	**Partly Supported:** Caregivers who are older and

Table 4.8 (cont.)

Hypothesis	Relationship Tested	Finding
	with lower education, and unemployed, with more children and more living at home; the spouse/partners are more likely to spend more time on caregiving.	work at Time 1 are more likely to provide longer caregiving hours per week
1.2	If the couples have more family resources, such as government provided health insurance, have private long-term care insurance, use outpatient surgery, have a history of hospital or nursing home stays, and use home care services, the spouse/partner caregiver is less likely to spend time on caregiving.	**Partly Supported:** Caregivers who used home care are less likely to provide longer caregiving hours per week
1.3	If the care recipients have higher ADL and IADL index scores, higher cognitive impairment, and higher memory problems, the couple caregivers are less likely to spend more time on caregiving. However, if both the caregiver and recipient have poorer health, such as the spouse/partner caregivers have higher ADL and IADL index scores, lower cognitive impairment, and lower memory problems, they are less likely to spend time on caregiving.	**Partly Supported:** Care recipients who have higher ADL and IADL function impairments, their spouse/partner as caregivers are less likely to provide longer caregiving hours per week
Research Question 2 **What are the impacts of caregiving hours at Time 1 on informal caregivers' physical health, psychological health, and economic well-being at Time 2, when controlling both care recipients' and caregivers' predisposing, enabling, and needs factors at Time 1?**		
2.1	More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' subjective physical health (self-rated	**Unsupported:** Length of caregiving hours provided by caregivers at Time 1 are not

Table 4.8 (cont.)

Hypothesis	Relationship Tested	Finding
	health) at Time 2.	significant correlated with caregivers' self-rated health at Time 2
2.2	More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' objective physical health (chronic illness) at Time 2.	**Partly supported: P**roviding longer **c**aregiving hours by caregivers at Time 1 are marginally positively significant correlated with caregivers' numbers of chronic illness at Time 2
2.3	More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' psychological health at Time 2.	**Unsupported:** Length of Caregiving hours provide by caregivers at Time 1 are not significant correlated with caregivers' psychological health at Time 2
2.4	More time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' economic well-being at Time 2.	**Unsupported:** Providing longer caregiving hours by caregivers at Time 1 have no significant association with caregivers' level of wealth at Time 2.

CHAPTER 5

DISCUSSION

5.1 Main Findings

5.1.1 Research Question One

5.1.1.1 Descriptive Results

This study found that 66.02% of informal caregivers provided fewer caregiving hours (less than 20 hours per week), followed by 17.09% of caregivers who provided a medium amount of caregiving hours (between 20~56 hours per week) and 16.89 % who provided more caregiving hours (more than 56 hours per week). Most caregivers are female (54.02%), White (85.73%), and average 66.19 years old, with an average of 12.31 years of education and work (66.47%). In addition, the average number of persons living in the household is 2.47 and there is an average of 3.35 living children.

Compared to caregiving hours provided by primary informal caregivers in 1989 and 1999, Wolff and Kasper (2006) used nationally representative data set from the National Long-Term Care Survey and Informal Caregiver Survey to develop representative profiles of older adults with disabilities and their primary informal caregivers. They found that spouses spent on average 41 hours on caregiving in 1989 and 38 hours in 1999. The trend of the caregiving hours is decreasing slowly. According to current results, spouses/partners as caregivers reported providing an average of 33.03 caregiving hours per week in 2008, which are similar to other recent studies (Pinquart & Sörensen, 2003; Shahly et al., 2013). For example, Pinquart and Sörensen's study (2003), adopting meta-analysis through analyzing other studies, pointed out higher caregiving hours in non-representative samples (36.7 hour per week). In addition, compared with Shahly et al.'s study (2013), they found that spouses spent on average 31.3

caregiving hours per week. The above result is consistent with the updated study. Whether the declines in spouses/partners' care are because of the changes in Medicare and Medicaid reimbursement, secondary caregiver involvement, or other factors is beyond the scope of the current study (Wolff & Kasper, 2006).

5.1.1.2 Multivariate Results of Caregiving hours

Using the 2008 waves from HRS, this study examined the determinants of caregiving hours by considering predisposing, enabling, and need factors from both care recipients and their caregivers. Unexpectedly, most of the caregivers' predisposing factors (race/ethnicity, gender, education, living children, and numbers of people in the household) and need factors (ADL and IADL) are not significantly related to caregiving hours, results that are inconsistent with previous studies (e.g., Feld et al., 2004; Feld et al., 2010; Miller & Cafasso, 1992; Robison et al., 2009). Only caregivers' age has a positive relationship with the length of caregiving hours. In addition, care recipients with fewer ADL and IADL limitations are more likely to provide informal care (Feld et al., 2004). Previous studies have shown that caregivers who are female, minority, and more highly educated are more likely to spend more time on caregiving (Miller & Cafasso, 1992; Robison et al., 2009). However, the current study did not find the relationship between caregivers' predisposing factors/social demographic characteristics and the length of caregiving hours.

Partly contrary to my **Hypothesis 1.1**, employed caregivers are more likely to provide more caregiving hours. This finding is not supported by prior studies. For example, one study indicated that, compared to men, women are more likely to leave the workforce (Stone, Cafferata, & Sangl, 1987). Another study showed that the status of employment has no association with longer caregiving hours (Pavalko and Artis, 1997). Three possibilities may

explain why this result was different compared to other studies. First of all, Stone, Cafferata, and Sangl's (1987) study found that compared to sons and sons-in-law, daughters and daughters-in-law were more likely to reduce work hours or leave the job market to give care to their parents or parents-in-law, which is different from this study's main focus of caregivers as spouses/partners. The dissimilar results might be caused by different caregiving relationships, which still need to be further investigated by future study. Second, Pavalko and Artis (1997) used one data set, the National Longitudinal Survey of Mature Women (NLS) from the 1984 and 1987 waves, while my study is based on another, the Health and Retirement Study (HRS) from the 2008 and 2010 waves. Using samples from different data sets may also explain why the current finding is different than prior research. Thirdly, whether their workplaces have more flexibility on their jobs or these caregivers reduced their working hours, rearranged their schedules, or experienced other mediating factors (e.g. received support from other helpers) needs further exploration. In addition, compared with full-time caregivers (not working) who are more likely to be in an isolated environment and lack interpersonal interaction and other resources, employment for those spouse/partner caregivers might provide social support (e.g., sharing similar caregiving experiences), other resources (e.g., consulting in workplace), and short respite/break from caregiving roles, which might help perceive higher well-being (Gordon, Pruchno, Wilson-Genderson, Murphy, & Rose, 2012; Saunders, 2010).

On the one hand, my **Hypothesis 1.2** is partly supported, caregivers who used home care services are less likely to provide more caregiving hours, but this does not hold for care recipients who used home care services. The result of this study reinforces prior studies' findings: caregivers using home care services (e.g., adult day service use) are more likely to reduce primary caregiving hours as a respite which also decrease their feeling of role overload

and alleviate caregivers' stress and negative psychological health (Gaugler et al., 2003). However, the HRS did not measure the exact content of home care services that caregivers used, the quality of these services, and how often those services were used. Therefore further research is needed to explore the mechanisms and determine why these services provided to caregivers rather than care recipients are more effective.

From the final hierarchical ordinal logistic regression analysis, partly consistent with my **Hypothesis 1.3**, I found that among care recipients with higher ADL and IADL scores, their caregivers were less likely to provide more caregiving hours at Time 1. This finding is similar to results from prior studies, which indicate that, for care recipients with a serious level of functional impairment, their spouses/partners as caregivers are less likely to provide caregiving hours (Cai et al., 2009; Feld et al., 2010; Strain & Blandford, 2002). As discussed in Chapter 2, from an expanded Andersen's behavior model and empirical studies, higher care recipient functional impairments makes it more difficult to provide caregiving without having long-term service and support available (Feld et al., 2010). Similar to other findings, recipients with higher IADL are more apt to report a higher likelihood of being admitted to a long-stay nursing home, which, in turn, decreases caregiving hours (Cai et al., 2009). Care recipients' ADL and IADL functioning had great impacts on caregivers, more particularly for spouses/partners who became solo caregivers (Feld et al., 2010).

5.1.2 Research Question Two

Using the 2008 and 2010 waves from the HRS, this study examined the impacts of caregiving hours at Time 1 on caregivers' physical and psychological health, and wealth at Time 2 when controlling for predisposing, enabling, and need factors from both care recipients and caregivers at Time 1.

5.1.2.1 Descriptive Results

The results indicate that, in 2010, among those caregivers, nearly 33.5% reported their self-rated health as poor or fair, with 32.75% reported good and 27.1% reported very good; only 6.66% reported an excellent health status. Compared to data from the 1982, 1989, and 1999 National Long-Term Care Survey (Stone, Cafferate, & Sangl, 1987; Wolff & Kasper, 2006), showed 34.2% of spousal caregivers reported their self-rated health as poor or fair in 1999, 39.3% in 1989, and 43.5% in 1982. Around 14% of spousal caregivers reported their self-rated health as excellent in 1999, compared with 19.9% in 1989 and 17.2% in 1982. The results of the current study suggested that the percentage of spousal caregivers who reported self-rated health as poor or fair is consistent with the prior/updated finding in 1999 and is lower than in 1989 and 1982.

In addition, caregivers averaged 2.66 chronic illnesses, which represented objective physical health (range from 0~7) and their psychological scores, which refer to psychological health, averaged 1.84 (range from 0~8) at Time 2. Combining assets and income from both care recipient and caregiver, the household wealth in 2010 averaged $344,985.93 (median=$76,053), with a range of $-136,455 to $10,142,200.

5.1.2.2 Multivariate Results of Physical and Psychological Health

Lengths of Caregiving Hours on Physical and Psychological Health. Results showed that caregivers who gave longer hours of caregiving at Time 1 were more likely to have a higher level of chronic illness (objective physical health) but not self-rated health status (subjective physical health). Only one partial association between longer length of caregiving hours at Time 1 and the frequency of caregivers' chronic illnesses (objective physical health) at Time 2 is found. The correlation between the length of caregiving hours at Time 1 and caregivers' self-rated health is

not established. My Hypothesis 2.1—more time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' subjective physical health (self-rated health) at Time 2—is not supported; but Hypothesis 2.2—more time spent on caregiving at Time 1 is associated with a larger negative effect on the caregivers' objective physical health (chronic illness) at Time 2—is partly supported. Although the length of caregiving hours provided by caregivers at Time 1 are not significantly correlated with caregivers' self-rated health at Time 2, caregivers who provide longer length of caregiving hours at Time 1 are more likely to have higher level of chronic illness at Time 2, which is consistent with prior findings. Studies showed that informal caregivers who provide care for the frail elderly suffer more health problems because caregiving demands intensive labor and time, which will compromise caregivers' energy and time to take care of themselves (Beach, Schulz, & Yee, 2000; Kuzuya et al., 2011; Levine et al., 2010; Mahoney et al., 2003; Ness, 2011; Pinquart & Sörensen, 2007; Van Houtven et al., 2011).

Three possible explanations may demonstrate why hypothesis 2.1 is not sustained. First, the fact that the length of caregiving hours has no significant association with self-rated health is similar to Zehner Ourada and Walker's (2014) finding. However, they found that the different relationships/types of caregiver (e.g., spouse and adult child) have positive significant association with self-rated health, which is not included the current analysis. Second, only a two-year measure of caregiving hours was used in this study, which might not adequately detect intensity of caregiving and capture the complex realities of caregiving. The third possible explanation is the fact that self-rated health (SRH) is based on self-perceived and measured physical health. Many researchers recommend against using SRH because it may by modified by personality, age, race/ethnicity, and culture, even the language used in the interview (Lockenhoff, Terracciano, Ferrucci, & Costa, 2012; Viruell-Fuentes, Morenoff, Williams, & House, 2011). For

example, among the U.S. population, elderlies positively report higher SRH instead of age-related declines in objective health because they frequently compare themselves to negative stereotypes of counterparts their age (Mayer, Slifkin, & Skinner, 2005).

As for the association between caregivers' caregiving at Time 1 and psychological health at Time 2, Hypothesis 2.3 is not supported. The findings about the impacts of caregiving at Time 1 related to caregivers' psychological problems are not consistent with the larger body of literature (Beach, Schulz, & Yee, 2000; Pinquart & Sörensen, 2003; Pinquart & Sörensen, 2005; Pinquart & Sörensen, 2006; Robison et al., 2009). Most previous findings showed that caregivers who provide more hours of caregiving are more likely to feel helpless and have increased depression and anxiety symptoms (Beach, Schulz, & Yee, 2000; Robison et al., 2009). One explanation for this result may be other significant variables, such as social support and caregiver burden, were not measured and included in this current study. Because other studies indicated that the Caregiver Reaction Assessment used a multidimensional measurement to represent caregiver burdens which has significant impact on caregivers' psychological health (Given et al., 1992; Lawton, Moss, Kleban, Glicksman, & Rovine, 1991; Saunders, 2009) and lack of family or social support has detrimental effects on caregivers' psychological health (Given et al., 1992). Another reason may be that a two-year period is too short to observe the shift; for example, the average psychological problems of caregivers changed only from 1.77 in 2008 to 1.84 in 2010. Another explanation is similar to self-rated health evaluations, in that the elderly are more likely to underestimate their psychological problems and easily adapt to their current situations because caregiving over time becomes more routine. Further studies need to look at these issues. Third, compared with caregivers as adult children, spousal/partner caregivers think that providing care to spouse/partners is part of the marital commitment and his/her responsibility under the social-

normative culture, particularly for Black, Hispanic, and Asian Americans (Lafferty et al., 2009; Lawton, Moss, Kleban, Glicksman, & Rovine, 1991; Patterson & Malley-Morrison, 2006). Therefore, they might be less likely to express sad, unhappy, depressed, unmotivated, lack of energy, and loneliness as psychological problems. In addition, this study only focused on primary caregivers as spouse/partner rather than incorporating multiple helpers (e.g., adult children) into the analysis which might be the reason that spouse/partners did not rate their self-rated health and psychological problems poorly because they got other family members' or other emotional and social support.

Predisposing, Enabling, and Needs Factors on Physical and Psychological Health. In addition to the main effects of different lengths of caregiving hours on caregivers' physical and psychological health, other predisposing factors as well as enabling and need factors, from both care recipients and caregivers, associated with caregivers' physical and psychological health are also examined in the current study. For self-rated health (subjective physical health), the results were inconsistent with other studies (Arnsberger et al., 2012; Bianchi & Milkie, 2010; Lin et al., 2012; Robison et al., 2009) and similar to Beach, Schulz, and Lee's study (2000) that found that socio-demographic variables have weak association to health related outcomes. I found that care recipients' age, caregivers' gender, race/ethnicity, education, employment, living children, and number of people in the household had no significant impact on caregivers' self-rated health. The difference in results from the current study and those of other studies might be explained by the following reasons: including measures of variables, types of samples, and different data sets. For instance, Arnsberger et al.'s study (2012) focused only on female caregivers and the samples were in California (N=1,295). In contrast, this study focused on both female and male spouse/partner caregivers and used a nationally representative sample. Furthermore, they

categorized self-rated health into five groups (poor, fair, good, very good, and excellent), while this study categorized four groups (poor and fair, good, very good, excellent). Moreover, Lin et al. (2012) drew on data from the 2004 wave of National Long-Term Care Survey and Robison et al.'s study (2009) used data from the 2007 Connecticut Long-Term Care Needs Assessment.

In addition, I found no strong association between caregivers' resources and wealth at Time 1 and their self-rated health at Time 2, which is inconsistent with prior research (Arnsberger et al., 2012; Mitrani et al., 2008; Papastavrou et al., 2009; Robinson et al., 2009; Siefert et al., 2008; Vellone et al., 2008). A possible explanation for the different findings in my study and other studies is that several of the studies were conducted outside the US and used different measurements. For example, all of the studies were not conducted in the US (Mitrani et al., 2008; Papastavrou et al., 2009; Siefert et al., 2008; Vellone et al., 2008), excepting only Arnsberger et al.'s and Robinson et al.'s studies. Although these two studies found a strong positive association between informal caregivers' income levels and higher scores for self-rated health, they used income rather than wealth. This study used wealth, which represents assets and incomes from both care recipients and caregivers. In addition, one study used six waves (1992-2002) of the HRS and confirmed that there is no significant impact of wealth on either the husband's or wife's health (Michaud & Van Soest, 2008).

Not surprisingly, relationships between care recipients' and caregivers' ADL scores and caregivers' prior self-rated health, level of chronic illness, and psychological health are statistically significant in the current study, which is consistent with previous research (Arnsberger et al., 2012; Ko, Aycock, & Clark, 2007; Lin et al., 2012; McCullagh et al., 2005). My findings suggest that care recipients with higher level of functional impairments (ADL) and caregivers with higher level of functional impairments (ADL), higher level of chronic illness and

psychological problems, and lower levels of prior self-rated health at Time 1 negatively affect caregivers' self-rated health at Time 2. Prior studies suggest that caregivers with more chronic illness and sleeping and mental problems are more likely to report lower level of self-rated health status (Arnsberger et al., 2012; McCullagh et al., 2005). Lin et al. (2012) further illustrated that poor health or disability strongly predict caregivers' physical and psychological health and explained why prior lower level of self-rated health negatively predict current lower level of self-rated health. However, that care recipients having higher IADL scores positively affects self-rated health is unexpected. The result may be explained by different data set and type of samples.

For chronic illness (objective physical health), inconsistent with other studies (Pinquart and Sörensen, 2005; Pinquart and Sörensen, 2006)), I found that care recipients' age and caregivers' education, living children, and number of people in the household had no significant effects on the caregivers' chronic illness. Similar potential explanations, including measures of variables, types of sample, and different data set, have been discussed above. However, unexpectedly, I found a negative relationship between caregivers' age, gender, and employment, and caregivers' chronic illness. Caregivers who were older, female, and worked, compared with caregivers who were younger, male, and who did not work, are less likely to report higher levels of chronic illness. Caregivers who work might have better medical insurance provided by employers, which might also help prevent having higher levels of chronic illness. In addition, I found a positive association between race/ethnicity as non-White, compared with White, and the levels of caregivers' chronic illness. Consistent with other studies (Dilworth-Anderson et al., 2002; Feld et al., 2004; Fennell et al., 2012; Fennell et al., 2010), caregivers who are minorities have less available long-term care supports and services which in turn may lead to higher frequencies of chronic illness.

Furthermore, consistent with some previous studies (Arnsberger, Lynch, & Li, 2012; Bianchi & Milkie, 2010; Pinquart & Sörensen, 2005; Pinquart & Sörensen, 2011), the relationship between several enabling factor and the frequencies of caregivers' chronic illness are statistically significant in the current study. My finding suggest that care recipients' nursing home overnight stays and caregivers undergoing outpatient surgery negatively influence caregivers' reported higher occurrences of chronic illness, and care recipients' hospital stays and health plans provided by government positively influence the frequencies of caregivers' chronic illness.

In contrast to the negative association between care recipients' IADL and the amounts of caregivers' chronic illness, several studies have documented positive effects for caregivers related to care recipients' higher functional impairments (ADL and IADL), cognitive impairment, and memory problems (Gaugler et al., 2004; Jeon, Brodaty, & Chesterson, 2005; Sharpe, Butow, Smith, McConnell, & Clarke, 2005; Robison et al., 2009). The current study needed to drop this variable, which measured cognitive impairment because nearly half of the sample had missing values for this variable. Otherwise, the positive association between care recipients' cognitive impairment and the frequencies of caregivers' chronic illness is also found which is not presented in the table.

Regarding psychological health, these results may vary because prior studies did not have consistent findings about how predisposing factors influence caregivers' psychological health (Covinsky et al., 2003; Lin, Fee, & Wu, 2012; Robison et al., 2009; Yates, Tennstedt, & Chang, 1999). The results of the current study showed that most predisposing factor have no significant effects on caregivers' psychological health. The exception is a negative relationship between caregivers' employment and psychological problems. Research indicates that caregivers

constantly faced role overload due to balancing work and care at the same time and having less time and fewer opportunities to take care of themselves and socialize with friends, which in turn, might affect their psychological health. Similar to predisposing factors, only one enabling factors—caregivers' outpatient surgery—has statistically significant negative effects on caregivers' psychological health. Consistent with prior studies (Pinquart & Sörensen, 2006; Pinquart & Sörensen, 2007; Robison et al., 2009; Vitaliano, Zhang, & Scanlan, 2003), caregivers who have outpatient surgery, which represents worsened health status might in turn have negative effects on their psychological health, compared to those without outpatient surgery. When discussing need factors, care recipients' ADL, caregivers' prior self-rated health, and psychological problems have statistically significant impacts on caregivers' psychological problems. Consistent with prior studies (Pinquart & Sörensen, 2007; Pinquart & Sörensen, 2011; Robison et al., 2009), a negative association is found between three categories of prior psychological problems (none, 1~2, and 3~5), compared to 6 and more psychological problems, and caregivers' psychological problems at Time 2. Caregivers with lower levels of psychological problems at Time 1 have a negative significant impact on caregivers' psychological problems at Time 2.

Not surprisingly, I also found that care recipients with higher ADL and caregivers reporting prior self-rated health as poor or fair, compared to care recipients with lower ADL and caregivers reporting self-rated health as excellent, have positive significant effects on caregivers' psychological problems. Caregivers who took care of recipients with higher level of functional impairments typically suffer more burdens and challenges, which in turn lead to worse perceptions of general health status and high levels of negative feelings and also cause psychological problems (e.g., hopelessness, depression, anxiety, and lack of energy).

5.1.2.3 Multivariate Results of Wealth

Lengths of Caregiving Hours on Wealth. My Hypothesis 2.5 which examined whether caregiving has a negative impact on accumulation of wealth is not supported, although one study also showed that for a majority of people, caring for parents does not have a significant impact on wealth over time (Greenfield, 2013). In other words, the negative impact of caregiving on wealth impacted only a small percentage of families (4.3%). However, many studies have indicated that the cost of long-term care, including assisted living, home care services, out-of-pocket medical expenses, and other related spending, has affected economic status (Toseland, & Smith,2006; Van et al., 2011; Wakabayshi & Donato, 2006; Wakabayshi, 2010; Weuve, Boult, & Morishita,2000). One reason may be that the current study only focused on spouses/partners as caregivers; the impacts of caregiving on wealth may be different for other caregivers who are children, friends, and relatives. Another reason may be that the long-term care related expenses were not measured comprehensively. Lost income, employment-related costs, and reduced future pension benefits rather than current household wealth may be better indicators of the negative influence on caregivers' economic well-being (Dosman & Keating, 2005). Because household wealth includes varied resources (e.g., social security, SSI, assets, and other incomes) from both care recipient and caregiver, this may hide the negative impacts of caregiving on caregivers' real economic well-being which represents the costs of caregiving.

Predisposing, Enabling, and Needs Factors on Wealth. Although the association of different lengths of caregiving hours on caregivers' wealth is not established, other predisposing factors as well as enabling and need factors, from both care recipients and caregivers, associated with caregivers' wealth are also examined in the current study. Partly consistent with prior study (Greenfield, 2013), only caregivers' education is statistically significantly associated with

household wealth. Other predisposing factors, including care recipients' age, caregivers' age, gender, race/ethnicity, employment, living children, and numbers of people in the household had no significant effects on household wealth.

In addition, consistent with several previous studies (Mitrani et al., 2008; Papastavrou et al., 2009; Siefert et al., 2008; Vellone et al., 2008), relationships between several enabling factors and wealth are statistically significant in the current study. My findings suggest care recipients with private long-term care insurance who have outpatient surgery positively affect household wealth, and caregivers' nursing home overnight stays and prior household wealth negatively affect household wealth at Time 2. Prior research indicates nursing home stays have remarkable and statistically negative impacts on total household wealth because the average higher cost of nursing home stays the fact that and Medicare usually does not cover nursing home stays (Banerjee, 2012; Kaye, Harrington, & LaPlante, 2010). Care recipient and caregivers always need to bear the cost and spend down their money until the point that they qualify for Medicaid (Banerjee, 2012). In addition, the current study found that only 8% of persons purchased private long-term care insurance to cover the cost of nursing home stays, which was lower compared to a prior study's finding of 14% (Banerjee, 2012). Therefore, caregivers with more nursing home overnight stays and without private long-term care insurance suffered higher financial burdens, which might consume household wealth and prevent the future accumulation of each type of wealth. Not surprisingly, consistent with other studies, I found a negative association between three categories of prior household wealth (under 25th, 25th~50th, and 50th ~75th quintile), compared with above 75th, and household wealth at Time 2.

Inconsistent with prior a study (Michaud & Van Soest, 2008), I found that both care recipients' and caregivers' ADL and IADL, caregivers' physical and psychological health have

no significant effects on household wealth. Research indicates that both spouses' health have strong causal effects on household wealth. Several reasons that might explain the differences in my result and this study include the length of observed waves, constructed variables, and analysis models. For example, Michaud and Van Soest's (2008) study used 6 waves, which is longer than this study (only 2 waves). They adopted a "constructed health index (CHI)" (including self-rated health, chronic illness, at least one ADL, body mass index, and CESD scores) and used panel data vector autoregressive model. My study used ADL, IADL, self-rated health, chronic illness, and psychological problems.

5.2 Limitations

There are several things that need to be considered when analyzing and interpreting the data. This study has at least five limitations. First, this study only used a two-wave dataset (2008 and 2010) from HRS. If I could have observed longer periods of caregiving patterns among informal caregivers, the study might have captured more dynamic relationships and provided a dialogue for accumulative advantage/disadvantage theory. The challenge is that, if longer periods had been studied, more persons from the dyad units might have been lost because of the death of respondents and their caregivers.

Second, because this study focuses on dyadic data analysis through combined helper files who are mainly spouses/partners, those caregivers who are children (including daughters, daughters-in-law, sons, and, sons-in-laws) and other relatives, friends, or neighbors are not analyzed which might have a different portrait of the caregiving-caregiver dynamic, leaving an incomplete picture of the comprehensive phenomenon of informal caregiving. In addition, this study puts more emphasis on these spouses/partners as helpers to examine their determinants of caregiving hours at Time 1 and then analyze the association between caregiving hours at Time 1

and their physical health, psychological health, and wealth at Time 2. The examination of associations between caregiving hours at Time 1 and spousal outcome at Time 2 might be different, if future study could compared those spouses/partners who provide no caregiving hours to those spouses/partners who provide different lengths of caregiving hours through comparison (e.g., pairing similar predisposing, enabling, and need factors). Furthermore, spousal caregivers who were in poor physical and psychological health and were too busy for caregiving might be less likely to participate in the survey (Zehner Qurada & Walker, 2014).

Third, all of the main variables of interest—employment status, caregiving hours, physical health, psychological health, and wealth—are based on self-reports and are only measured every two years. For example, caregiving hours are recalled and measured for the past month, which is extrapolated to represent caregiving hours per week during 2008. Therefore, the caregiving experience in reality may be hard to capture and the results may be inaccurate because of not measuring caregiving monthly. In addition, the use of self-reports, particular for the older populations, which rely on the elder respondent's memory, willingness, and ability to report accurately, may have led to bias.

Fourth, information about recipients and caregivers sexuality, language use, and culture are not available in the HRS database. This study also does not include secondary or other caregivers' other information (such as predisposing, enabling, and need factors from adult children, relatives, friends, or neighbors) and available long-term care service and support (LTSS) that care recipients and caregivers can access. Having such information would provide further insight on how these factors affect care recipients' and caregivers' arrangements of LTC, which also may influence informal caregivers' time spent on caregiving. In addition, caregiving experiences and patterns are complicated and diverse. Although a quantitative approach may get

better inferential statistics for generalizing to the whole elderly population, the depth of the caregiving phenomena and the subjective interpretations of caregivers may be oversimplified or overlooked.

Finally, causality among the predisposing, enabling, and need factors of both care recipients' and caregivers' and caregiving hours, as well as the relationships between caregiving hours and physical, psychological, and economic well-being cannot be well established. Other unmeasured factors from other levels, including neighborhood characteristics (poverty rates, minority rates, and social capital) and community resources (such as long-term care services and support) as well as macro level policies (such as state LTC policies), might have great influences on these relationships (Gardner & Gilleskie, 2009; Goda, 2011).

5.3 Implications

This project used the Andersen's expanded behavioral model (with dyad unit analysis), considering both care recipients' and informal caregivers' characteristics to examine the effects of informal caregivers' time spent on caregiving and its impacts on caregivers' outcomes, including physical health, psychological health, and economic well-being. Using dyad unit analysis gives the potential to enrich understanding of informal care from both care recipients' and caregivers' perspectives and also unravels the complexity in long-term care. The findings should be of interest to scholars, policy makers, healthcare providers, and informal caregivers. Because current LTC policy pays more attention to the needs of the impaired elderly, as opposed to the needs of caregiver, the allocation of in-home services to meet both care recipients and caregivers' needs should be considered. My findings contribute to the process of reconsidering and reconfiguring current LTC policies with the goal of decreasing adverse outcomes for caregivers later in life—particularly those caregivers who are most vulnerable to health and

economic problems.

5.3.1 Implication for Policy and Practice

As the current study indicates, care recipients with higher functional impairments (ADL and IADL) and caregivers who do not work and use home care services are less likely to provide more hours of caregiving, although the results did not show that most caregivers' predisposing, enabling, and need factors had significant associations with their caregiving hours. In addition, caregivers who provide more caregiving at Time 1 do not show significant impacts on subjective physical health, psychological health, and wealth at Time 2, except objective physical health (frequency of chronic illnesses). However, the needs and the negative impacts of being caregivers still need to be highlighted and examined, because the current long-term policy in the U.S is tending to encourage the elderly's' aging in place with a more private, free space to have control over their own lives, usually at lower cost (e.g., at home or in their familiar communities) rather than in nursing care facilities which lack quality and have higher costs (Lockhart, Giles-Sims, & Klopfenstein, 2009; Miller, Allen, & Mor, 2009). For example, the findings of care recipients with higher ADL and IADL, spouses/partners as caregivers are less likely to provide more caregiving hours. This indicates that, without suitable long-term care support and services (LTSS), caregivers may be unable to take care of their spouses/partners at home or in their communities, in order to keep their loved ones successfully aging in place. Therefore, the findings suggest to policy makers that they must allocate resources more efficiently and equitably, with the goal of improving the outcome for all informal caregivers regardless of gender, race/ethnicity, and socioeconomic status. And better support at the HCBS level may lessen the hidden costs to the public that manifest themselves in the future. The optimal policy is one that balances private and public responsibilities for the care of the elderly.

In addition, research indicates that about nine-tenths of the elderly in the sample were taken care of by their family members, friends, relatives, neighbors, or volunteers in the community-dwelling settings as "unpaid help" (Kaye, Harrington, & LaPlante, 2010). Caregivers consistently reduced their working hours, reschedule plans, or even quit jobs to fulfill the care needs of their love one, which in turn, will decrease their work and future pension benefits. Reforming financing, training, and supporting these informal caregivers as important care partners, and considering both care recipients' and caregivers' intervention programs, can contribute to improve care recipients' outcomes and postpone the institutionalized care and decrease unnecessary rehospitalizations, and also alleviate caregivers' physical, psychological, and financial burdens (Levine et al., 2010; Van Houtven et al., 2011).

For gerontological practitioners, how to help promote and improve caregivers' health is a great challenge. Studies have pointed out that nutrition, exercise, cognitive coping strategies, rest and relaxation, recreation, and socializing have been shown to be effective in promoting caregivers' health (Given & Given, 1998; McDonald, Fink, & Wykle, 1999; Ostwald, 2009). In addition, many studies showed that adult day services, in-home visits, and telephone follow-up sessions also give caregivers respite, which in turn, reduces caregivers' feeling of role overload, alleviates psychological problems (e.g., stress, worry, and frustration), and enhances caregivers' health (Elliott, Burgio, & DeCoster, 2010; Gaugler et al., 2003; Mahoney, Tarlow, & Jones, 2003; Van Houtven et al., 2011). All these findings indicate how gerontological practitioners can help caregivers access available support and services (e.g., respite care, home care service, and assisting living) and facilitate caregivers' time management and provide social support. All of these long-term care supports and services (LTSS) are significant in meeting caregivers' unmet needs, which might alleviate their physical, psychological, and financial burdens. Furthermore,

multi-component interventions, including gathering more information from caregivers, training, program development, and financing, can promote caregivers' health and reduce the health problems and, in turn, even relieve caregivers' pressure and depression symptoms.

Without understanding and examining the determinants of spouse/partner informal caregiving and the impacts of caregiving on caregivers using dyadic unit analysis (both of care recipients and caregivers), it will be very difficult to provide comprehensive programs to meet the needs of both care recipients and caregivers because of the lack of integrative service arrangements and the merging of sustainable funding. The availability of long-term support and services strongly affects informal caregivers' ability to provide care, which determines whether homes and communities are the best setting for aging and cultivating a continuum of care, instead of being a no-care zone (Cartier, 2003; Levine et al., 2010; Wallace, 1990). In addition, with changes in demographics, family structure, and social trends, the nature of LTC practice and policies also needs to be responsive, adjusted, or reformed to improve caregivers' physical health and psychological health, and resolve the difficulty of financial burdens and hidden costs to caregivers, particularly for those caregivers who are more vulnerable (minority elderly, LGBTQ, and those in poverty).

In conclusion, the current study provides a framework for research, policy, and practice concerning the determinants of caregiving and their impacts on caregivers' physical health, psychological health, and wealth by informing an understanding of the dyad unit analysis from both care recipients and caregivers characteristics, including predisposing (socio-demographic), enabling (e.g., health insurance and family resources), and need factors (e.g., ADL and IADL). Although most predisposing, enabling, and need factors from caregivers were not found to be significant in this study, it is still critical to investigate other related factors or other aspects from

community and state levels and provide long-term care service and support for caregivers. Supporting tailored to the caregivers' needs will likely decrease the burdens of caregiving, which in turn, can improve caregivers' physical health, psychological health, and economic well-being in later life under intensive caregiving conditions.

Our most notable finding is that caregivers who provide more caregiving hours are more likely to have higher level of chronic illnesses, compared to those who spend fewer or medium hours on caregiving. Because the frequencies of chronic illness often predict the caregivers' future health status, morbidity, and even mortality, as well as financial cost to society, if society wants to keep these informal caregivers as bedrock and frontline to provide care for their loved ones, then long-term care policy and gerontological practitioners need to target the long-term care support and service (LTSS) and available resources of those who provide more hours of caregiving, particularly the vulnerable elderly. Otherwise, these caregivers will continue to be at risk of suffering, and likely facing higher levels of health problems than caregivers who provide less and medium care, and non-caregivers. Only when gerontological practitioners and policymakers treat family caregivers as the most important part of health care provision and acknowledge their contributions as well as recognize their unmet needs, will the division of long-term care labor be characterized by greater integration and efficient cooperation (Kaye, Harrington, & LaPlante, 2010; Levine et al., 2010).

5.3.2 Implication for Research

Based on the findings and limitations of the current study, together with other studies, implications for future research are recommended. Caregivers' intensive caregiving hours at Time 1 have partial impacts on caregivers' frequencies of chronic illnesses at Time 2. However, no significant associations between caregivers' caregiving hours at Time 1 and caregivers' self-

rated health, psychological health, and wealth were found. These findings refer to the two years observation of caregiving hours in the current study, which may be too short to measure and represent the real caregiving intensity, period, and experiences. Other studies, such as Greenfield (2013) used six waves (12 years) of measurements on caregiving experiences and Wakabayashi and Donato (2006) analyzed two waves' data in 1988 and 1998 (10 years interval), longer durations of observations were recommended to capture the comprehensive caregiving trajectories. However, the issue of missing data is a challenge because of the mortality of care recipients and caregivers. In addition, future studies could incorporate multiple caregivers' information and use mixed methods of integrating qualitative and quantitative perspectives, which may help to bridge these gaps.

In addition, this study mainly focused on spouses/partners as helpers who provided caregiving. Those spouses/partners who did not provide caregiving (non-caregivers) were excluded. This may be the reason that the current study found no significant impacts of caregiving hours at Time 1 on caregivers' physical health, psychological health, and wealth at Time 2. Propensity score matching, which provides a way to summarize covariate information about treatment selection into a scalar value and which is also suitable for small sample sizes, is strongly recommended (Cepeda, Boston, Farrar, & Strom, 2003; Kurth et al., 2006). This strategy will help produce comparisons between spouses/partners who provided informal caregiving and those not providing caregiving under some nonrandomized conditions and may be able to distinguish the differences and impacts of caregiving on physical health, psychological health, and economic well-being. The results will be more accurate rather than being under-estimated or over-estimated.

In addition, adult children also often play an important role in providing care for their parents

or parents-in-law. A prior study indicated that 41.3% of caregivers are adult children, compared to 38.4% who are spouses/partners, and the rest are friends, relatives, or neighbors (Wolff & Kasper, 2006). Compared to the HRS helper file in 2008, 40.7 % of helpers are children (13.62% are sons or sons-in-law and 27.08% are daughters or daughters-in-law), followed by others (36.08%) and spouses/partners (23.22%). Future studies can compare whether caregivers in the different caregiving relationships have different caregiving patterns and whether those impact caregivers' physical health, psychological health, and economic well-being. Incorporating children as helpers into model analysis will help examine the dynamic of being multiple caregivers and their caregiving experiences. Furthermore, elderlies who are LGTBQ, minorities, single parents, and widows are more vulnerable to poverty, shortage of spouse/partner, and relative lack of available long-term care support and services. More studies need to examine their caregiving experiences and caregiving's impacts on their later physical, psychological, and financial burdens.

This study contributes to understanding the complex landscape of caregiving by analyzing dyadic relationships and considering caregiving's influences on caregivers' physical health, psychological health, and economic well-being separately. However, some other studies argue that macro policies prompt care recipients and informal caregivers to use formal and informal care services differently (Holly, Lufkin, Norton & Houtven, 2010; Reschovsky, 1989). Other studies showed that state policies (e.g., Medicaid policies and state tax subsidies for private LTC insurance) were strongly associated with LTC Medicaid enrollment or expenditures (Gardner & Gilleskie, 2009; Goda, 2011). The next step in a future study may be applying the geocode of each respondent from HRS sensitive data to explore community and macro level policy influences. Through using a geographic information system (ArcGIS) and Hierarchical Linear

Model (HLM) to merge individual level data, county level characteristics, and state level data into analysis, multilevel influences such as the effects of neighborhood characteristics and community resources as well as state LTC polices on informal caregiving and informal caregiver's outcomes may become more visible.

REFERENCES

Adelman, R. D., Tmanova, L. L., Delgado, D., Dion, S., & Lachs, M. S. (2014). Caregiver Burden: A Clinical Review. *JAMA*, *311*(10), 1052-1060.

American Association of Retirement Persons (2004). *Caregiving in the U.S.*. National Alliance for caregiving and AARP.

Andersen, R. & Aday, L.A. (1978). Access to medical care in the U.S.: Realized and potential. *Medical Care, 16*(7), 533-546.

Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior, 36*(1), 1-10.

Andersen, R.M., & Newman, J.F. (2005). Societal and individual determinants of medical care utilization in the U.S. *The Milbank Quarterly*, *82*(4), 1-28. Reprinted from the *Milbank Memorial Fund Quarterly: Health and Society*, (1973), *51*(1), 95-124. Style and usage are unchanged.

Anderson, G. F., & Hussey, P. S. (2000). *Population aging: a comparison among industrialized countries*.

Andrews, G. J. Milligan, C. Phillips, D.R., & Skinner, M. W. (2009) Geographical gerontology: Mapping a disciplinary intersection. *Geography Compass,* 3(5), 1641-1659.

Arno, P. S., Levine, C., & Memmott, M.M. (1999). The economic value of informal caregiving. *Health Affairs, 18*(2), 182-188.

Arnsberger, P., Lynch, U., & Li, F. (2012). The effects of caregiving on women's self-assessed health status: An international comparison. *Health Care for Women International, 33*(10), 878-895.

Banerjee, S. (2012). Effects of Nursing Home Stays on Household Portfolios. *EBRI issue brief/Employee Benefit Research Institute*, (372), 4-18.

Bass, D. M., & Noelker, L. S. (1987). The influence of family caregivers on elder's use of in-home services: An expanded conceptual framework. *Journal of Health and Social Behavior, 28*(2), 184-196.

Bastawrous, M. (2013). Caregiver burden: A critical discussion. *International Journal of Nursing Studies, 50*(3), 431-441. doi: 10.1016/j.ijnurstu.2012.10.005

Beach, S. R., Schulz, R., Yee, J. L., & Jackson, S. (2000). Negative and positive health effects of caring for a disabled spouse: Longitudinal findings from the caregiver health effects study. Psychology and Aging, 15(2), 259-271.

Bianchi, S. M., & Milkie, M. A. (2010). Work and family research in the first decade of the 21st century. *Journal of Marriage and Family, 72*(3), 705-725.

Burton, L. C., Newsom, J. T., Schulz, R., Hirsch, C. H., & German, P. S. (1997). Preventive health behaviors among spousal caregivers. *Preventive medicine*, *26*(2), 162-169.

Cai, Q., Salmon, J.W., & Rodgers, M.E. (2009) Factors associated with long-stay nursing home admissions among the U.S. elderly population: Comparison of logistic regression and the cox proportional hazards model with policy implications for social work. *Social Work in Health Care,* 48(2), 154-168.

Capistrant, B. D., Moon, J. R., Berkman, L. F., & Glymour, M. M. (2012). Current and long-term spousal caregiving and onset of cardiovascular disease. *Journal of Epidemiology and Community Health, 66*(10), 951-956. doi:10.1136/jech-2011-200040; 10.1136/jech-2011-200040

Cepeda, M. S., Boston, R., Farrar, J. T., & Strom, B. L. (2003). Comparison of logistic regression versus propensity score when the number of events is low and there are multiple confounders. *American Journal of Epidemiology*, *158*(3), 280-287.

Chang, H., Chiou, C., & Chen, N. (2010). Impact of mental health and caregiver burden on family caregivers' physical health. *Archives of Gerontology and Geriatrics, 50*(3), 267-271.

Congress Budget Office (2012). *The 2012 Long-Term Budget Outlook*, Retrieved from http://www.cbo.gov/publication/43288

Covinsky, K. E., Newcomer, R., Fox, P., Wood, J., Sands, L., Dane, K., & Yaffe, K. (2003). Patient and caregiver characteristics associated with depression in caregivers of patients with dementia. *Journal of General Internal Medicine, 18*(12), 1006-1014.

Dentinger, E., & Clarkberg, M. (2002). Informal caregiving and retirement timing among men and women gender and caregiving relationships in late midlife. *Journal of Family Issues, 23*(7), 857-879.

Dilworth-Anderson, P., Williams, I. C., & Gibson, B. E. (2002). Issues of race, ethnicity, and culture in caregiving research: A 20-year review (1980–2000). *The Gerontologist, 42*(2), 237-272.

Earle, A., & Heymann, J. (2012). The cost of caregiving: Wage loss among caregivers of elderly and disabled adults and children with special needs. *Community, Work & Family, 15*(3), 357-375.

Elliott, A. F., Burgio, L. D., & DeCoster, J. (2010). Enhancing caregiver health: findings from the resources for enhancing Alzheimer's caregiver health II intervention. *Journal of the American Geriatrics Society*, *58*(1), 30-37.

Engelhardt, G. V., & Kumar, A. (2011). Pensions and household wealth accumulation. *Journal of Human Resources, 46*(1), 203-236.

Fast, J. E., Williamson, D.L., & Keating, N.C. (1999). The hidden costs of informal elder care. *Journal of Family and Economic Issues, 20*(3), 301-326.

Feld, S., Dunkle, R. E., & Schroepfer, T. (2004). Race/ethnicity and marital status in IADL caregiver networks. Research on Aging, 26(5), 531-558.

Feld, S., Dunkle, R. E., Schroepfer, T., & Shen, H. (2010). Does gender moderate factors associated with whether spouses are the sole providers of IADL care to their partners? *Research on Aging, 32*(4), 499-526.

Fennell, M. L., Clark, M., Feng, Z., Mor, V., Smith, D. B., & Tyler, D. A. (2012). Separate and unequal access and quality of care in nursing homes: Transformation of the long term care industry and implications of the research program for aging Hispanics. In J.L. Angel et al. (eds.)*, Aging, Health, and Longevity in the Mexican-Origin Population,* 207-225.

Fennell, M. L., Feng, Z., Clark, M. A., & Mor, V. (2010) Elderly Hispanics more likely to reside in poor-quality nursing homes. *Health Affairs,* 29(1), 65–73.

Gardner, L., & Gilleskie, D.B. (2009). *The effects of state Medicaid policies on the dynamic savings patterns and Medicaid enrollment of the elderly*. NBER, Working Paper 12208.

Gaugler, J. E., Jarrott, S. E., Zarit, S. H., Stephens, M. A. P., Townsend, A., & Greene, R. (2003). Adult day service use and reductions in caregiving hours: effects on stress and psychological well-being for dementia caregivers. *International Journal of Geriatric Psychiatry*, *18*(1), 55-62.

Given, B. A., & Given, C. W. (1998). Health promotion for family caregivers of chronically ill elders. *Annual review of nursing research*, *16*(1), 197-217.

Given, C. W., Given, B., Stommel, M., Collins, C., King, S., & Franklin, S. (1992). The caregiver reaction assessment (CRA) for caregivers to persons with chronic physical and mental impairments. *Research in Nursing & Health, 15*(4), 271-283.

Goda, G. S. (2011). The impact of state tax subsidies for private long-term care insurance on coverage and Medicaid expenditures. *Journal of Public Economics, 95*(7), 744-757.

Gordon, J. R., Pruchno, R. A., Wilson-Genderson, M., Murphy, W. M., & Rose, M. (2012). Balancing caregiving and work role conflict and role strain dynamics. *Journal of Family Issues, 33*(5), 662-689.

Greenfield, J. C. (2013). *The long-term costs of caring: How caring for an aging parent impacts wealth trajectories of caregivers.* Unpublished Ph.D.'s Thesis, Washington University in ST. Louis, St. Louis, Missouri.

Han, B., & Haley, W. E. (1999). Family caregiving for patients with stroke review and analysis. *Stroke, 30*(7), 1478-1485.

Harrington, C., Ng, T., Kaye, H. S., & Newcomer, R. J. (2009) Medicaid home and community based services: Proposed policies to improve access, costs and quality. *Public Policy & Aging Report,* 19(2), 13-18.

Health and Retirement Study (2004). Sample weights and sample selection indicator of the physical measures in HRS 2004. Technical Report. The University of Michigan.

Health and Retirement Study (2008). *Sample evolution: 1992-1998*. Technical Report. The University of Michigan.

Health and Retirement Study (2014).*Sampling Weights: Revised for Tracker 2.0 and Beyond*. Technical Report. The University of Michigan. Retrieved from http://hrsonline.isr.umich.edu/sitedocs/wghtdoc.pdf

Heeringa, S. G., Fisher, G. G., Hurd, M., Langa, K. M., Ofstedal, M. B., Plassman, B. L., Rodger, W. L., & Weir, D. R. (2009). Aging, demographics, and memory study (ADAMS). *Sample Design, Weighting, and Analysis for ADAMS,* Health and Retirement Study Technical Report.

Holicky, R. (1996). Caring for the caregivers: The hidden victims of illness and disability. *Rehabilitation Nursing, 21*(5), 247-252.

Holly, A., Lufkin, T.M., Norton, E.C., & Van Houtven C.H., (2010) *Informal care and formal home care use in Europe and the United States*. Technical Report - Institute of Health Economics and Management, University of Lausanne, Switzerland.

Hong, S. (2010). Understanding patterns of service utilization among informal caregivers of community older adults. *The Gerontologist, 50*(1), 87-99.

Jenkins, C.L. (2001). Resource effects on access to long-term care for frail older people. *Journal of Aging & Social Policy, 13*(4), 35-52.

Karp, F. (2007). *Growing older in America: The health & retirement study.* National Institute on Aging, National Institutes of Health, US Department of Health and Human Services.

Kaye, H. S., Harrington, C., & LaPlante, M. P. (2010). Long-term care: who gets it, who provides it, who pays, and how much? *Health Affairs*, *29*(1), 11-21.

Kurth, T., Walker, A. M., Glynn, R. J., Chan, K. A., Gaziano, J. M., Berger, K., & Robins, J. M. (2006). Results of multivariable logistic regression, propensity matching, propensity adjustment, and propensity-based weighting under conditions of nonuniform effect. *American Journal of Epidemiology*, *163*(3), 262-270.

Lafferty, A., Treacy, M., Drennan, J., Phelan, A., Quin, S., Fealy, G., et al. (2009). *Public perceptions of elder abuse: A literature review.* Prepared on Behalf of the National Centre for the Protection of Older People (NCPOP) Research Team. Dublin: Ireland.

Lawton, M. P., Moss, M., Kleban, M. H., Glicksman, A., & Rovine, M. (1991). A two-factor model of caregiving appraisal and psychological well-being. *Journal of Gerontology*, *46*(4), P181-P189.

Levine, C., Halper, D., Peist, A., & Gould, D. A. (2010). Bridging troubled waters: Family caregivers, transitions, and long-term care. *Health Affairs, 29*(1), 116-124.

Lima, J.C., Allen, S.M., Goldscheider, F., & Intrator, O. (2008). Spousal caregiving in late midlife versus older ages: Implication of work and family obligations. *Journal of Gerontology: Social Science, 63B*(4), S229-S238.

Lin, I., Fee, H. R., & Wu, H. (2012). Negative and positive caregiving experiences: A closer look at the intersection of gender and relationship. *Family Relations, 61*(2), 343-358.

Mahoney, D. F., Tarlow, B. J., & Jones, R. N. (2003). Effects of an automated telephone support system on caregiver burden and anxiety: Findings from the REACH for TLC intervention study. *The Gerontologist, 43*(4), 556-567.

McDonald, P. E., Fink, S. V., & Wykle, M. L. (1999). Self-reported health-promoting behaviors of black and white caregivers. *Western journal of nursing research*, *21*(4), 538-548.

MetLife Mature Market Institute, (2011). *The MetLife Study of Caregiving: Costs to Work Caregivers: Double Jeopardy for Baby Boomers Caring for their Parents*. Westport: CT.

Michaud, P. C., & Van Soest, A. (2008). Health and wealth of elderly couples: Causality tests using dynamic panel data models. *Journal of health economics*, *27*(5), 1312-1325.

Miller, B., & Cafasso, L. (1992). Gender differences in caregiving: Fact or artifact? *The Gerontologist, 32*(4), 498-507.

Milligan, C. (2009). *There's no place like home: place and care in an ageing society*. MPG Books Group, UK.

MMI (2011). *The MetLife Study of Caregiving: Costs to Work Caregivers: Double Jeopardy for Baby Boomers Caring For Their Parents*. (Westport, CT: MetLife Mature Market Institute). Retrieved from https://www.metlife.com/assets/cao/mmi/publications/studies/2011/mmi-caregivingcosts-working-caregivers.pdf

Mui A. C. & Burnette D. B. (1994). Long-term care service use by frail elders: Is ethnicity a factor? *The Gerontologist, 34*(2), 190-198 doi:10.1093/geront/34.2.190

National Alliance of Caregivers in collaboration with AARP (NAC/AARP, 2009). *Caregiving in the U.S. 2009: A Focused Look at Those Caring for the 50+*. Bethesda, MD: Author. Retrieved from http://assets.aarp.org/rgcenter/il/caregiving_09.pdf

Ness, D. L. (2011). Women, caregivers, families, and the affordable care act's bright promise of better care. *Generations, 35*(1), 38-44.

Ostwald, S. K. (2009). Who is caring for the caregiver? Promoting spousal caregiver's health. *Family & community health*, *32*(1), S5-S14.

Patterson, M., & Malley-Morrison, K. (2006). A cognitive-ecological approach to elder abuse in five cultures: Human rights and education. *Educational Gerontology, 32*, 73-82.

Pavalko, E. K., & Artis, J. E. (1997). Women's caregiving and paid work: Causal relationships in late midlife. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 52*(4), S170.

Pavalko, E. K., & Woodbury, S. (2000). Social roles as process: Caregiving careers and women's health. *Journal of Health and Social Behavior, 41*(March), 91-105.

Pearlin, L. I., Mullan, J. T., Semple, S. J., & Skaff, M. M. (1990). Caregiving and the stress process: An overview of concepts and their measures. *The Gerontologist, 30*(5), 583-594.

Pinquart, M., & Sörensen, S. (2003). Differences between caregivers and noncaregivers in psychological health and physical health: A meta-analysis. *Psychology and Aging, 18*(2), 250-267.

Pinquart, M., & Sörensen, S. (2005). Ethnic differences in stressors, resources, and psychological outcomes of family caregiving: A meta-analysis. *The Gerontologist, 45*(1), 90-106.

Pinquart, M., & Sörensen, S. (2006). Gender differences in caregiver stressors, social resources, and health: An updated meta-analysis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 61*(1), P33-P45.

Pinquart, M., & Sörensen, S. (2007). Correlates of physical health of informal caregivers: A meta-analysis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 62*(2), P126-P137.

Pinquart, M., & Sörensen, S. (2011). Spouses, adult children, and children-in-law as caregivers of older adults: A meta-analytic comparison. *Psychology and Aging, 26*(1), 1-14.

Reschovsky, J.D. (1989). The roles of Medicaid and Economic factors in the demand for nursing home care. *Health Service Research, 33*(4), 787-813.

Robison, J., Fortinsky, R., Kleppinger, A., Shugrue, N., & Porter, M. (2009). A broader view of family caregiving: Effects of caregiving and caregiver conditions on depressive symptoms, health, work, and social isolation. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 64B*(6), 788-798.

Saunders, M. M. (2009). Indicators of health-related quality of life in heart failure family caregivers. Journal of Community Health Nursing, 26(4), 173-182.

Saunders, M. M. (2010). Working and caregiving: A comparison of employed and unemployed caregivers of older heart failure patients. *Holistic Nursing Practice, 24*(1), 16-22. doi:10.1097/HNP.0b013e3181c8e469; 10.1097/HNP.0b013e3181c8e469

Shahly, V., Chatterji, S., Gruber, M. J., Al-Hamzawi, A., Alonso, J., Andrade, L. H., Angermeyer, M.C., Bruffaerts, B., Bunting, B., Caldas-de-Almeida, J.M., Hu, C., Karam, E.G., Lepine, J.P., Levinson, D., Medina-Mora, M.E., Posada-Villa, J., Sampson, N.A., Trivedi, J.K., & Kessler, R. C. (2013). Cross-national differences in the prevalence and correlates of burden among older family caregivers in the World Health Organization World Mental Health (WMH) Surveys. *Psychological medicine*, *43*(04), 865-879.

Shen, H. (2010). *Resources and strategic mobilization (RSM) model of productive aging: Examining older Americans' participation in various productive activities.* Unpublished Ph.D.'s Thesis, University of Michigan in Ann Arbor, Ann Arbor, Michigan.

Smith, A. E. (2009) *Ageing in urban neighbourhoods: Place attachment and social exclusion*. Bristol: Policy Press.

Stoller & Cutler, (1992). The impact of gender on configurations of care among married elderly couples. *Research on Aging, 14*(3), 313-330.

Stone, R., Cafferata, G. L., & Sangl, J. (1987). Caregivers of the frail elderly: A national profile. *The Gerontologist, 27*, 616–626.

Thompson, L. (2004). *Long-term care: Support for family caregivers.* Georgetown University, Health Policy Institute.

Toseland, R. W., & Smith, T. L. (2006). The impact of a caregiver health education program on health care costs. *Research on Social Work Practice, 16*(1), 9-19.

Townsend, A., Noelker, L., Deimling, G., & Bass, D. (1989). Longitudinal impact of interhousehold caregiving on adult children's mental health. *Psychology and Aging, 4*(4), 393-401.

Van Houtven, C. H., Voils, C. I., & Weinberger, M. (2011). An organizing framework for informal caregiver interventions: Detailing caregiving activities and caregiver and care recipient outcomes to optimize evaluation efforts. *BMC Geriatrics, 11*(1), 77-94.

Vitaliano, P. P., Zhang, J., & Scanlan, J. M. (2003). Is caregiving hazardous to one's physical health? A meta-analysis. *Psychological Bulletin, 129*(6), 946-972.

Wakabayashi, C. (2010). Effects of immigration and age on health of older people in the United States. *Journal of Applied Gerontology, 29*(6), 697-719.

Wakabayashi, C., & Donato, K. M. (2006) Does caregiving increase poverty among women in later life? Evidence from the Health and Retirement Survey. *Journal of Health and Social Behavior,* 47(3), 258-274.

Walker, A. J., Pratt, C. C., & Eddy, L. (1995). Informal caregiving to aging family members: A critical review. *Family Relations,44*, 402-411.

Wallace, S. P., Levy-Storms, L., Kington, R. S., & Andersen, R. M. (1998) The persistence of race and ethnicity in the use of long-term care. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 53B* (2), S104-S112.

Weuve, J. L., Boult, C., & Morishita, L. (2000). The effects of outpatient geriatric evaluation and management on caregiver burden. *The Gerontologist, 40*(4), 429-436.

Wiles, J. (2005). Conceptualizing place in the care of older people: The contributions of geographical gerontology. *Journal of Clinical Nursing, 14* (s2), 100-108. Blackwell Science Ltd.

Wolff, J. L., & Kasper, J. D. (2006). Caregivers of frail elders: Updating a national profile. *The Gerontologist, 46*(3), 344-356.

Yates, M. E., Tennstedt, S., & Chang, B. H. (1999). Contributors to and mediators of psychological well-being for informal caregivers. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 54*(1), P12-P22.

Yee, J. L., & Schulz, R. (2000). Gender differences in psychiatric morbidity among family caregivers: A review and analysis. *The Gerontologist, 40*(2), 147-164.

Zehner Ourada, V. E., & Walker, A. J. (2014). A comparison of physical health outcomes for caregiving parents and caregiving adult children. *Family Relations, 63*(1), 163-177.

APPENDIX A: RESEARCH VARIABLES

Variable	HRS Questions/ Descriptions	Operationalization
For Question 1		
Dependent Variable **Caregiving Time**		
Freq. of help given-days per week (LG070)	[Let's think for a moment about the help you receive that we just talked about. First, /Next,] the help from [HELPER WHO LOOP]. During the last month, on about how many days did [HELPER WHO LOOP] help you per week?	Continuous variable (1-7)
Caregiving intensity (LG073)	On the days [HELPER WHO LOOP] helps you, about how many hours per day is that	Continuous variable (1-24)
Helper relationship (LG069)	Relationship	2=Spouse/Partner;
Helpers sex (LG074)	Affirm sex of helper	1=Male; 2= Female
Independent Variable		
Predisposing Factors		
Care Recipients		
Age (tracker file: Birthyr)	Respondent age at time of observation (use wave year minus birth year, for example in 2008, the age in 2008=2008-Birthyr)	Continuous variable
Gender (tracker file: Gender)	Measured dichotomously	1=male 2=female
Race/ethnicity (tracker file: Race, Hispanic)	Measured for each respondent at entry into the study, as determined by response to these two questions: "Do you consider yourself primarily White or Caucasian, Black or African American, Other?" and "Do you consider yourself Hispanic or Latino?"	Race/Ethnicity 0=not obtained 1=White/Caucasian 2=Black/African American 7=other Hispanicity type 0=Hispanic, type unknown 1=Mexican American 2=Other Hispanic 5=Not Hispanic/Not obtained
Education (tracker file: Schlyrs)	Education is measured for each respondent at entry into the study, as determined by response to this question: "What is the highest grade of school or year of college you completed?"	Continuous variable
Marital status (tracker file: Lmarst in 2008)	Measured at each wave with a series of questions based on status at intake; measure operationalized as categorical with the following categories: Married, Married/Spouse absent, Partnered, Separated, Divorced, Separated/Divorced, Widowed, Never Married.	1=married 2=Separated/Divorced 3=Widowed 4=Never married 5=Marital status unknown
Employment Current job status- 1 (LJ005M1)	Now I'm going to ask you some questions about your current employment situation. Are you working now, temporarily laid off, unemployed and looking for work, disabled and unable to work, retired, a homemaker, or what?	Dichotomous variable 1=working now; 2=unemployed and looking for work; 3=temporarily laid off,

Variable	HRS Questions/ Descriptions	Operationalization
		on sick or other leave; 4=disabled; 5=retired; 6=homemaker; 7. Other
HRS WORK PER WEEK (LJ172)	[How many hours a week do you usually work on this job? /How many hours a week do you usually work in this business?]	Continuous variable 1-34 part-time; 35 full-time
Caregivers		
Age (tracker file: Lage)	Respondent age at time of observation	Continuous variable
Gender (tracker file: Gender)	Measured dichotomously	1=male 2=female
Race/ethnicity (tracker file: Race, Hispanic)	Measured for each respondent at entry into the study, as determined by response to these two questions: "Do you consider yourself primarily White or Caucasian, Black or African American, Other?" and "Do you consider yourself Hispanic or Latino?"	Race/Ethnicity 0=not obtained 1=White/Caucasian 2=Black/African American 7=other Hispanicity type 0=Hispanic, type unknown 1=Mexican American 2=Other Hispanic 5=Not Hispanic/Not obtained
Education (tracker file: Schlyrs)	Education is measured for each respondent at entry into the study, as determined by response to this question: "What is the highest grade of school or year of college you completed?"	Continuous variable
Marital status (tracker file: Lmarst in 2008)	Measured at each wave with a series of questions based on status at intake; measure operationalized as categorical with the following categories: Married, Married/Spouse absent, Partnered, Separated, Divorced, Separated/Divorced, Widowed, Never Married.	1=married 2=Separated/Divorced 3=Widowed 4=Never married 5=Marital status unknown
Number of living children (LB034)	Is that child alive today? How many of them are still living?	Continuous variable (0~19)
Number of resident children (LA099)	Children live together	Continuous variable (0~7)
Enabling Factors		
Care Recipients		
Medicare eligibility (LN001)	Are you currently covered by Medicare health insurance?	1=yes 5=no
Medicaid eligibility (LN006)	Are you currently covered by Medicaid health insurance?	1=yes 5=no
Military's health insurance programs (LN007)	Are you currently covered by TRI-CARE, CHAMPUS, CHAMP-VA, or any other military health care plan?	1=yes 5=no
Number of private insurance plan (LN023)	How many other private health insurance plan do you have (do not include LTC insurance)?	Continuous variable (0~13)
LTC insurance (LN071)	Do you have nay LTC insurance with specifically covers nursing home care for a year or more or any part of personal or medical care in your home?	1=yes 5=no

Variable	HRS Questions/ Descriptions	Operationalization
AMT pay O-O-P home health service (LN194) Many missing data	About how much did you pay out-of-pocket for in-home medical care (in the last two years)?	Continuous variable A log transformation will be applied to total annual O-O-P home health service
Total annual out-of-pocket (O-O-P) for major medical cost (LN211)	Including hospital (LN204), nursing home (LN205), outpatient surgery (LN206), doctor visit (LN207), dental (LN208), prescription (LN209), in home health service spending (LN210), and other health service (LN239) (LN211=LN204+LN205+LN206+LN207+LN208+LN209+LN210 +LN239) (Hospice care (LN328) is not included)	Continuous variable A log transformation will be applied to total annual O-O-P medical cost
Caregivers		
Medicare eligibility (LN001)	Are you currently covered by Medicare health insurance?	1=yes 5=no
Medicaid eligibility (LN006)	Are you currently covered by Medicaid health insurance?	1=yes 5=no
Military's health insurance programs (LN007)	Are you currently covered by TRI-CARE, CHAMPUS, CHAMP-VA, or any other military health care plan?	1=yes 5=no
Number of private insurance plan (LN023)	How many other private health insurance plan do you have (do not include LTC insurance)?	Continuous variable (0~13)
LTC insurance (LN071)	Do you have nay LTC insurance with specifically covers nursing home care for a year or more or any part of personal or medical care in your home?	1=yes 5=no
AMT pay O-O-P home health service (LN194) Many missing data	About how much did you pay out-of-pocket for in-home medical care (in the last two years)?	Continuous variable A log transformation will be applied to total annual O-O-P home health service
Total annual out-of-pocket (O-O-P) for major medical cost (LN211)	Including hospital (LN204), nursing home (LN205), outpatient surgery (LN206), doctor visit (LN207), dental (LN208), prescription (LN209), in home health service spending (LN210), and other health service (LN239) (LN211=LN204+LN205+LN206+LN207+LN208+LN209+LN210 +LN239) (Hospice care (LN328) is not included)	Continuous variable A log transformation will be applied to total annual O-O-P medical cost
Household		
Own the house (LH004) Household Level	Do you [and your] [husband/wife/partner] own your home, rent it, or what?	1=own 2=rent 3=lives rent-free 7=other
Current house value (LH020) Household Level	What is its present value? I mean, what would it bring if it were sold today?	Continuous variable (0~35,000,000) A log transformation will be applied to current house value
Need Factors		
Care Recipients		
Mobility (*RwMOBILA*) Difficulty walking several blocks (LG001) Difficulty walking one block (LG003)	The five tasks included in the mobility index are walking several blocks, walking one block, walking across the room, climbing several flights of stairs and climbing one flight of stairs. If respondents have each problem mentioned above is coded as	Continuous variable (0~5)

Variable	HRS Questions/ Descriptions	Operationalization
Difficulty walking across the room (LG016) Difficulty climbing several flights of stairs (LG006) Difficulty climbing one flight of stairs (LG007)	1 and 0 otherwise. The higher numbers mean the worse situation of mobility.	
Functional dependency ADL *(RWADLA)* Difficulty walking (LG016) Difficulty bathing (LG021) Difficulty eating (LG023) Difficulty get in/out bed (LG025) Difficulty using toilet (LG030)	ADL includes the five tasks, include walking across a room, bathing, eating, getting in or out of bed, and using toilet. If respondents have each difficulty mentioned above is coded as 1 and 0 otherwise. The higher numbers mean the higher needs of ADL help.	Continuous variable (0~5)
IADL (RWIADLZA) Meal preparation difficulty (LG041) Grocery shop difficulty (LG044) Making phone calls difficulty (LG047) Taking medications difficulty (LG050) Managing money help (LG059)	IADL include preparing meals, shopping, using a telephone, taking medication, and handling money. If respondents have each difficulty mentioned above is coded as 1 and 0 otherwise. The higher numbers mean the higher needs of IADL help.	Continuous variable (0~5)
Cognitive impairment Memory related disease (LC069)	Cognitive impairment is measured by whether the respondent has reported any a memory-related disease [Has a doctor ever told you that you have a memory-related disease?].	1=yes 5=no
Caregivers		
Mobility (*RwMOBILA*) Difficulty walking several blocks (LG001) Difficulty walking one block (LG003) Difficulty walking across the room (LG016) Difficulty climbing several flights of stairs (LG006)	The five tasks included in the mobility index are walking several blocks, walking one block, walking across the room, climbing several flights of stairs and climbing one flight of stairs. If respondents have each problem mentioned above is coded as 1 and 0 otherwise. The higher numbers mean the worse situation of mobility.	Continuous variable (0~5)

Variable	HRS Questions/ Descriptions	Operationalization
Difficulty climbing one flight of stairs (LG007)		
Functional dependency ADL *(RWADLA)* Difficulty walking (LG016) Difficulty bathing (LG021) Difficulty eating (LG023) Difficulty get in/out bed (LG025) Difficulty using toilet (LG030)	ADL includes the five tasks, include walking across a room, bathing, eating, getting in or out of bed, and using toilet. If respondents have each difficulty mentioned above is coded as 1 and 0 otherwise. The higher numbers mean the higher needs of ADL help.	Continuous variable (0~5)
IADL (RWIADLZA) Meal preparation difficulty (LG041) Grocery shop difficulty (LG044) Making phone calls difficulty (LG047) Taking medications difficulty (LG050) Managing money help (LG059)	IADL include preparing meals, shopping, using a telephone, taking medication, and handling money. If respondents have each difficulty mentioned above is coded as 1 and 0 otherwise. The higher numbers mean the higher needs of IADL help.	Continuous variable (0~5)
Cognitive impairment Memory related disease (LC069)	Cognitive impairment is measured by whether the respondent has reported any a memory-related disease [Has a doctor ever told you that you have a memory-related disease?].	1=yes 5=no
Physical health at T1	The same as physical health at T2 (please see below)	Continuous variable (0~8)
Psychological health at T1	The same as psychological health at T2 (please see below)	Continuous variable (0~9)
Wealth at T1	The same as wealth at T2 (please see below)	Continuous variable A log transformation will be applied to Household wealth to achieve the normality of distribution.
For Question 2		
Dependent Variable **Informal Caregivers' Outcome 2010**		
Physical Health at T2		
Subjective Physical health (self-rated health)	Using a 5-point Liker scale: "would you say your health in general is excellent, very good, good, fair, or poor?"	1=poor or fair; 2=good; 3=very good; 4= excellent

Variable	HRS Questions/ Descriptions	Operationalization
Objective Physical Health high blood pressure (LC005) diabetes (LC010) cancer (LC018) lung disease (LC030) heart disease (LC036) stroke (LC053) emotional/psychiatric problems (LC065) arthritis (LC070)	Health condition/ Chronic illness The sum of indicators for whether a doctor has ever told the respondent that he or she has ever had a particular disease. The eight included diseases are high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, emotional/psychiatric problems, and arthritis. If respondents have each disease mentioned above is coded as 1 and 0 otherwise. The higher numbers mean the worse situation of physical health condition.	Continuous variable (0~8)
Psychological Health/ Depression *(RwCESD)* at T2 Feeling depressed (MD110) Felt activities were efforts (MD111) Was sleep restless (MD112) Felt loneliness (MD114) Felt sad (MD116) Felt unmotivated (MD117) Was happy (MD113) Enjoyed life (MD115) Felt full of energy (MD118)	Psychological health will be measured using the same scheme as physical health with numbers assigned to each respondent indicating the number of psychological illnesses they are experiencing. Using a score on the Center for Epidemiologic Studies Depression (CESD) scale. The CESD score (RwCESD) is the sum of six "negative" indicators minus three "positive" indicators. The negative indicators measure whether the respondent experienced the following sentiments all or most of the time: depression, everything is an effort, sleep is restless, felt alone, felt sad, and felt unmotivated. The positive indicators measure whether the respondent felt happy, enjoyed life, and felt full of energy, all or most of the time. If respondents have each symptom mentioned above is coded as 1 and 0 otherwise. The higher numbers mean the worse situation of psychological health.	Continuous variable (0~9)
Household Wealth at T2(Assets – Debt)		
Household Income at T2	Social Security, Pensions, and Type and amounts in the top three pension plans in the past 12 months	Continuous variable
Assets at T2	All asset components minus all debt (1) Assets: include net values of primary residence (LH020), real estate (LQ134), business or farm (LQ147), Individual Retirement Account (IRA)(LQ166_1, LQ166_2, LQ166_3), stocks (LQ320,LQ326), bonds(LQ331, LQ338), checking accounts(LQ345,LQ352), and certificates of deposit (LQ357, LQ366), transportation	Continuous variable A log transformation will be applied to Household wealth to achieve the normality of distribution.

Variable	HRS Questions/ Descriptions	Operationalization
	(LQ371), and others assets (LQ376, LQ381). (2) Debt: calculated as the sum of money owed on credit card, medical, mortgage, equity loans, and other debts (Q478).	
HHMEM NON JOB INCOME RECD AMOUNT (LQ437)	Not including job income, about how much in total did other members of your family living (here/there) receive in [Last Calendar Year] from Social Security, pensions, welfare, interest, gifts, or anything else, (before taxes and other deductions)?	Continuous variable
HHMEM ASSET AMOUNT (LQ442)	About how much altogether would that amount to, minus any debts (he/she/they) might have?	Continuous variable
Economic Well-being at T2 (Not used) Economic well-being will be measured by three indicators (Wakabayashi and Donato, 2006): 1) the risk of living in poverty; 2) the likelihood of receiving public assistance from Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF), or food stamps; and 3) the likelihood of receiving Medicaid.		
Less than Federal poverty level (FPL)	The first indicator is the risk of living in poverty, which is equals 1 if caregivers reported household income were less than 200% of federal poverty line (FPL) and 0 otherwise (U.S. Census Bureau, 2010).	1=yes 0=no
Receive public assistance	The second indicator is the likelihood of receiving public assistance from Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF), or food stamps (LQ400). If respondent receives any of each public assistance is coded as 1 and 0 otherwise.	1=yes 0=no
Receive public Medicaid	The third indicator is the likelihood of receiving Medicaid (Wakabayashi & Donato, 2006). If respondent receives any of each public assistance is coded 1 and 0 otherwise.	1=yes 0=no
Independent Variable		
Caregiving Time (please see Dependent Variables for Question 1)		
Control Variable (please see Independent Variables for Question 1)		